

THE CONTRIBUTION OF A COMMUNITY BASED HIV COUNSELING AND TESTING (HCT) INITIATIVE IN WORKING TOWARDS INCREASING ACCESS TO HIV COUNSELING AND TESTING IN CAPE TOWN, SOUTH AFRICA.

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DECLARATION

By submitting this dissertation electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

This dissertation includes 6 original papers, of which 2 are published in peer-reviewed journals, 2 have been accepted for publication in peer-reviewed journals, 1 has been provisionally accepted for publication in a peer review journal and 1 has been submitted to a peer review journal. The development and writing of the papers (published and unpublished) were the principal responsibility of myself and, for each of the cases where this is not the case, a declaration is included in the dissertation indicating the nature and extent of the contribution of co-authors.

Date: 13 October 2017

CANDIDATE'S OVERALL CONTRIBUTION TO DISSERTATION

Contribution to the research studies included in this dissertation

All the research studies included in this dissertation include participants who used a mobile or stand-alone HIV testing service that formed part the CB-HCT initiative which I set up, managed and maintained. I conceived the relevant research questions, designed the studies, collected and managed the data, worked on the analysis and interpreted the findings. I am first author on all six manuscripts included in this dissertation and wrote all manuscripts, which are presented as separate chapters. My exact contribution within each manuscript and study is detailed at the beginning of each chapter.

Contribution to the community-based HIV counselling and testing initiative (CB-HCT) initiative

The CB-HCT initiative was funded as a direct service delivery project by PEPFAR through the Centers for Disease Control and Prevention (CDC) in two separate cooperative agreements between 2007 and 2017. During the initial cooperative agreement, I set up the CB-HCT initiative and maintained responsibility for the overall management and monitoring and evaluation of the initiative. In addition, I collaborated with non-governmental organizations (NGOs) to implement community-based HIV testing services, monitored their progress, capacity and expenditure. In 2011, I independently secured funding to continue the CB-HCT initiative (the second cooperative agreement). As the principal investigator, I assumed overall responsibility for all aspects of the project, including the collection of routine health data, data management, human resources, quality assurance, monitoring and evaluation, analysis and dissemination of data. During this time, I decided to use the routine data to answer scientific questions.

ABSTRACT

HIV testing services (HTS) play an important role in South Africa's response to the HIV epidemic and within the UNAIDS '90-90-90' strategy. Reaching the first '90', diagnosing 90% of individuals unaware of their HIV-positive status is vital for reaching the overall target. It is not possible for public health facilities to reach this target alone, as not all populations access health facilities optimally. Community-based testing services, provided outside of public health facilities are necessary for expanding access to HIV testing and must be explored. There is limited understanding of what constitutes access to community-based HTS. This dissertation used a framework to measure access along three dimensions, availability, affordability and acceptability, in order to determine access of a Community-Based HIV Counseling and Testing (CB-HCT) initiative, comprising mobile and stand-alone services.

This dissertation includes six research studies, all of which were conducted within communities situated in the Cape Metro district of the Western Cape Province, South Africa between 2008 and 2015. I used a mixed-methods approach, and included quantitative and qualitative studies as well as a cost-analysis. Participants self-initiated an HIV test at either a mobile or a stand-alone service at a CB-HCT initiative or a public health facility. Mobile services consisted of tents and a mobile van set up at busy spots within the community. Stand-alone centers were fixed sites, not attached to a health facility.

Consistently across studies (chapters 2, 4, 7), there was a higher proportion of males amongst the users at mobile (40% to 55%) compared to stand-alone and public health facilities (25% to 27%). As HIV test uptake in public health facilities is low for men, this finding infers that mobile HTS can meet the health seeking needs, regarding HIV testing, of men.

Consistently across studies (chapters 2,3,4,5), the majority of users walked to HTS, irrespective of which service they accessed, indicating the importance of providing a geographically accessible service that allows individuals to test in close proximity to where they are. Mobile was also able to provide an immediate opportunity to test for those walking past and not considering an HIV test at that time, highlighting the key role that opportunity to test plays in access. Service providers can create opportunities and play a direct role in making HTS available.

As most users walked to HTS, they incurred little or no direct costs. HTS were affordable in our setting. Providing services in close proximity to users will increase the affordability of HTS for the user and enable access (chapters 2 and 4).

The largest difference pertaining to user acceptability was waiting times, which were significantly shorter at mobile compared to stand-alone and public health facilities (chapters 2, 3, 4, 5), making mobile a viable option for reaching populations who do not want to wait in long queues. Reports of healthcare worker demeanour varied. Users at mobile and stand-alone consistently reported favourable staff attitudes, while users at public health facilities had mixed reports.

The cost to implement mobile and stand-alone services is important when considering scale-up of services. Overall, mobile cost less than stand-alone (\$77 764 and \$96 616 respectively)-(chapter 7). The mean cost per person tested for HIV at mobile was lower than at stand-alone because of the higher numbers of users testing at mobile, making it a viable service to scale-up. However, the mean cost of diagnosing and linking an HIV-infected person to HIV care was higher at mobile compared to stand-alone. HIV testing service is associated with linkage to care, users diagnosed at stand-alone were significantly more likely to link to care compared to those diagnosed at mobile (chapter 6). Evidenced-based linkage to care interventions will be essential prior to scaling up mobile services.

This dissertation provides important insight into the availability, affordability and acceptability of mobile and stand-alone HTS (CB-HCT initiative) as well as considerations for scale-up. The operational nature of this dissertation (studies are based on the operations of the CB-HCT initiative) is able to provide evidence-based lessons learnt for program implementation to make services accessible. Considering the user perspective when aiming to increase access to HIV-testing is vitally important as users have differing needs (pertaining to availability, affordability and acceptability). Tailoring HTS in line with these needs is critical if we are to build a more user responsive health system. The practical application of the findings make this a meaningful dissertation.

OPSOMMING

MIV-toetsingsdienste (MTD) speel 'n belangrike rol in Suid-Afrika se respons op die MIV-epidemie en UNAIDS se '90-90-90' strategie. Om die eerste '90' te haal – die diagnose van 90% van individue wat onbewus is van hul MIV-positiewe status – is noodsaaklik om die algehele mikpunt te bereik. Openbare gesondheidsfasiliteite sal nie hierdie mikpunt alleen kan bereik nie, want fasiliteite word nie optimaal deur alle bevolkingsgroepe benut nie. Gemeenskapsgebaseerde toetsingsdienste wat buite openbare gesondheidsfasiliteite voorsien word, is nodig om toegang tot MIV-toetsing uit te brei, en moet ondersoek word. Tog is begrip van wat presies toegang tot gemeenskapsgebaseerde MTD behels beperk. Hierdie proefskrif het 'n raamwerk gebruik om toegang volgens drie dimensies te meet – beskikbaarheid, bekostigbaarheid en aanvaarbaarheid – om sodoende die toeganklikheid van 'n Gemeenskapsgebaseerde MIV-berading en-toetsing (GG-MBT) inisiatief te bepaal. Die inisiatief het uit mobiele en losstaande dienste bestaan. Die mobiele diens was in die vorm van tente en 'n karavaan wat op besige plekke in die gemeenskap opgestel is. Die losstaande sentrums was vaste persele wat nie aan 'n gesondheidsfasiliteit gekoppel is nie.

Die proefskrif sluit ses navorsingstudies in, waarvan almal in gemeenskappe wat in die Kaapse Metro-distrik van die Wes-Kaapse provinsie, Suid-Afrika, tussen 2008 en 2015 uitgevoer was. 'n Gemengdemetodebenadering is gebruik en het kwantitatiewe en kwalitatiewe studies sowel as 'n kosteontleding ingesluit. Deelnemers het 'n self-geïnisieerde MIV-toets by 'n mobiele of losstaande diens in 'n GG-MBT-inisiatief laat doen óf by 'n openbare gesondheidsfasiliteit. Sommige studies het van roetine gesondheidsdienste data wat tydens die GG-MBT-inisiatief ingesamel is gebruik gemaak; ander het weer data direk by deelnemers ingesamel wat hetsy die GG-MBT-inisiatief of 'n openbare gesondheidsfasiliteit gebruik het. Sowel prospektiewe as retrospektiewe data is ingesluit.

'n Konsekwente bevinding regoor die studies (hoofstuk 2, 4 en 7) is dat 'n hoër proporsie mense by mobiele dienste (40% tot 55%) eerder as losstaande sentrums en openbare gesondheidsfasiliteite gebruikers was (25% tot 27%). Aangesien min mense hulle by openbare gesondheidsfasiliteite vir MIV laat toets, lei dít tot die gevolgtrekking dat mobiele MTD in mense se gesondheidsbehoefte met betrekking tot MIV-toetsing kan voorsien.

'n Konsekwente bevinding regoor die studies (hoofstuk 2, 3, 4 en 5) is dat die meerderheid gebruikers na die MTD gestap het, ongeag van watter diens hulle gebruik gemaak het. Dít dui op die belangrikheid van 'n geografies toeganklike diens wat individue in staat stel om in 'n area wat naby aan hulle geleë is, te toets. Mobiele het ook verbygangers, wat nie op daardie stadium 'n MIV-toets oorweeg nie, 'n onmiddellike

toetsingsgeleentheid gebied, wat die rol wat die geleentheid om te toets in toegang tot dienste speel beklemtoon. Diensverskaffers kan geleenthede skep en 'n direkte rol in die beskikbaarheid van MTD hê. Aangesien meeste gebruikers na die MTD gestap het, het hulle weinig indien enige direkte koste aangegaan. MTD was in ons konteks bekostigbaar. Dienslewering naby gebruikers sal MTD-bekostigbaarheid vir die gebruiker verder verhoog en toegang verbeter (hoofstuk 2 en 4).

Die grootste verskil rakende gebruikersaanvaarbaarheid, was wagtye: aansienlik korter by mobiele as losstaande sentrums en openbare gesondheidsfasiliteite (hoofstuk 2, 3, 4 en 5). Dít maak mobiele 'n praktiese opsie om bevolkingsgroepe wat nie in lang rye wil wag nie te bereik. Terugvoering oor gesondheidsorgwerkers se houding het gewissel. Gebruikers by mobiele en losstaande dienste het die personeel se ingesteldheid deurlopend as gunstig gerapporteer, terwyl gebruikers by openbare gesondheidsfasiliteite gemengde terugvoer gehad het.

Die koste om mobiele en losstaande dienste te implementeer is belangrik wanneer die opskaal van dienste oorweeg word. 'n Mobiele diens kos oor die algemeen minder as 'n losstaande sentrum (onderskeidelik \$77 764 en \$96 616) (hoofstuk 7). Die gemiddelde koste per persoon wat by mobiele vir MIV toets was laer as by losstaande sentrums aangesien mobiele dienste meer gebruikers lok. Dit maak mobiele 'n praktiese diens om op te skaal. Die gemiddelde koste om 'n MIV-geïnfekteerde persoon te diagnoseer en by MIV-sorg aan te sluit was egter hoër by mobiele as by losstaande sentrums. Die waarskynlikheid dat gebruikers by sorg sou aansluit was beduidend hoër onder diegene wat by losstaande sentrums gediagnoseer is as onder hulle eweknieë by mobiele (hoofstuk 6). Bewysgebaseerde intervensies vir aansluiting by sorg is daarom noodsaaklik voordat mobiele dienste opgeskaal kan word.

Hierdie proefskrif bied waardevolle insig tot die beskikbaarheid, bekostigbaarheid en aanvaarbaarheid van mobiele en losstaande MTD (GG-MBT-inisiatief), asook oorwegings vir die opskaal daarvan. Die operasionele aard van die proefskrif (studies is op die bedrywighede van die GG-MBT-inisiatief gegrond) maak dit moontlik om bewysgebaseerde lesse vir program implementering te bied om dienste toeganklik te maak. In die strewe na verbetering is dit van die kardinale belang om toegang tot MIV-toetsing uit die gebruiker se oogpunt te beskou. Gebruikers het immers verskillende behoeftes (wat beskikbaarheid, bekostigbaarheid en aanvaarbaarheid betref). Om 'n meer responsiewe gesondheidstelsel te bou, moet MTD na gelang van hierdie behoeftes pasgemaak word. Die praktiese toepassing van die bevindinge maak hierdie 'n waardevolle proefskrif.

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ABBREVIATIONS AND TERMINOLOGY

AIDS:	Acquired Immune Deficiency Syndrome
ART:	Antiretroviral therapy
CB-HTS:	Community-based HIV testing services. This term refers to HIV testing services provided outside of a public health facility.
CB-HCT initiative:	Community-based HIV counseling and testing initiative. This term is used for the purposes of this dissertation, to describe the community-based HIV testing services that I initiated in the Cape Metropole district of the Western Cape Province of South Africa. This initiative was implemented as a partnership between non-governmental organizations and an academic organization (Stellenbosch University) and comprised HIV testing services provided from two modalities; stand-alone and mobile.
CD4:	cluster of differentiation 4
CDC:	The Centers for Disease Control and Prevention
CPI:	Consumer price index
DTTC:	Desmond Tutu TB Center
ELISA:	Enzyme-Linked Immunosorbent Assay
HCT:	HIV counselling and testing. This term refers to a service that includes pre-test counselling, HIV testing and post-test counselling. This terminology was used from around 2010 until 2015.
HIV:	Human Immunodeficiency Virus
HTS:	HIV testing services. This terminology replaced the term HCT in 2015. It includes the full range of services that should be provided together with HIV testing. These services include: <ul style="list-style-type: none">• counselling (pre-test information and post-test counseling)• linkage to appropriate HIV prevention, treatment and care services and other clinical and support services• coordination with laboratory services to support quality assurance and the delivery of correct results.
IEC materials:	Information, education and communication materials

Modality:	The particular manner in which HIV testing services are provided. For the purposes of this dissertation, community-based modalities include; stand-alone and mobile.
Mobile modality:	HIV testing service provided on an outreach basis.
NGO:	Non-governmental organization
NHLS:	National Health Laboratory Services (in South Africa)
PEPFAR:	The President's Emergency Plan for AIDS Relief
PHC facility:	Primary healthcare facility
PICT:	Provider-initiated counselling and testing. This is when healthcare providers recommend an HIV test to everyone attending the health facility regardless of whether they have symptoms of HIV.
PMTCT:	Prevention of mother-to-child transmission
Potential users:	Individuals who have not accessed an HIV testing service, but intend to.
PrEP:	Pre-exposure prophylaxis
Provider-initiated testing:	HIV testing that is routinely offered by health care providers to persons attending healthcare facilities as a standard component of medical care.
Self-initiated testing:	Individuals who actively seek HIV testing at a facility that offers these services.
Stand-alone modality:	HIV testing service provided from a fixed site not attached to a public health facility.
STI:	Sexually transmitted infection
SU:	Stellenbosch University
TB:	Tuberculosis
UNAIDS:	Joint United Nations Program on HIV/AIDS
Users:	Individuals who access an HIV testing service and have an HIV test.
UTT:	Universal test and treat
VCT:	Voluntary counselling and testing. This term was used prior to 2010.
VMMC:	Voluntary medical male circumcision
WHO:	World Health Organization

CHAPTER 1: INTRODUCTION

In 2015, 36.7 million people globally were living with the human immunodeficiency virus (HIV) (1), of which 25.6 million were in sub-Saharan Africa (2). South Africa has the largest HIV burden in the world, with 7.1 million people living with HIV (3). Within South Africa, the HIV epidemic is generalized with primarily heterosexual transmission (4). Estimated HIV prevalence is 18% among the adult population 15-49 years (5). Overall, HIV prevalence is higher among females than males and higher among urban informal dwellers compared to those living in rural informal areas (6). More than half of the burden lies within the poorest 40% of the population (7).

To date, treatment and treatment as prevention have played a pivotal role in the fight against HIV. Now that treatment is freely available to everyone living with HIV in South Africa, it is time to place renewed energy into finding and diagnosing individuals living with HIV and linking them to care and treatment. HIV testing services (HTS) therefore play a fundamental role within the HIV program.

Focusing solely on the HIV epidemic in South Africa, this chapter describes the continually shifting HIV landscape with resultant changes in prevention and treatment policies, and positions HTS with linkage to care as a vital part of the HIV program. In an effort to find and diagnose individuals unaware of their HIV-positive status and link them to treatment, there is a need to expand HTS outside of public health facilities. The chapter provides comment on non-governmental organizations (NGOs) as private service providers; describes current knowledge about community-based HTS; and, provides an overview of drivers and barriers to HIV testing.

The chapter then focuses the reader's attention on the term 'access', providing a theoretical perspective and a general understanding of this multidimensional concept. This is followed by a description of a framework, used in this dissertation, to evaluate access along three dimensions: namely availability, affordability and acceptability.

After providing a rationale for this dissertation, there is a detailed description of the community-based HIV counseling and testing (CB-HCT) initiative, which is evaluated in this dissertation. The term 'CB-HCT initiative' is termed as such specifically for this dissertation. After providing the

overall aim and broad research methodology used in this dissertation, the chapter ends with a synopsis of all subsequent chapters and their relation to one or more of the ‘access’ dimensions.

1.1 THE ‘HIV LANDSCAPE’ IN SOUTH AFRICA

The HIV landscape in South Africa has been complex, one of continual change and recent progress. Amid political repression and AIDS denialism during the Mbeki era (8), it is estimated that 330 000 people died and 35 000 babies were born with HIV infection (9). Civil society has been instrumental in challenging government and fighting for access to antiretroviral treatment (10). The response to the HIV epidemic including changes in policy and the progress made with regards to prevention and treatment of HIV have been achieved through an interconnectedness between political will and the determination of civil society (11), a relationship that has evolved over time (12).

The recent political commitment towards ending the HIV epidemic is evident in numerous ways. For example, the coordinated response as set out in the National Strategic Plans in HIV, STIs and TB (13)(14)(15); the adoption of the ‘90-90-90’ target, as set by the Joint United Nations Program on HIV/AIDS (UNAIDS) (16); and, the rollout of universal test and treat, as recommended by the World Health Organization (WHO) (17). Financial commitment is evident in that the government funds 80% of South Africa’s HIV and tuberculosis (TB) expenditure, with the balance funded by international donors (18). Better accountability (19) together with improved coordination between civil society and government (10) has moved South Africa’s fight against the HIV epidemic forward. See Figure 1.1, which plots the key aspects of South Africa’s response to the HIV epidemic in terms of prevention and treatment along a timeline.

1.1.1 Prevention

During the 1980s and 1990s, condom use was the only form of prevention together with messaging around ‘safe sex’ practices (10). Neither of these interventions were successful in preventing the spread of HIV, as the number of new HIV infections per year rose sharply from 60 000 (in 1990) to 440 000 in 1995 and 540 000 in 2000 (3). Although messaging around abstinence, consistent condom use and delay of sexual debut reached countless adolescents and youth (20), there is little evidence to suggest that knowledge of HIV acquisition translates into behavior change. Among adults aged 15-49 years, self-reported condom use at last sex increased from 31% in 2002 to 65% in 2009 (21). In 2016, 58% of women and 65% of men reported condom use at last sex (22).

However, consistent condom use remains low at 36% (23) and diminishes over time in sexual relationships (24) with highest condom use (between 70% and 80%) reported for those with multiple, concurrent or non-regular partners (4).

In the early 2000s, scientific evidence showed that antiretroviral therapy (ART) could prevent vertical transmission from HIV-infected pregnant women to their babies (25). The South African health department was hesitant to roll out a national prevention of mother-to-child transmission (PMTCT) program, citing toxicity, affordability and limited capacity within the health services (25). In 2001, civil society took government to the Constitutional Court, which ruled that withholding the provision of PMTCT was a human rights violation (25). The national roll-out of PMTCT began in 2002, but remained slow until 2008, when South Africa appointed a new President and Health Minister (26). Transmission from mother to child subsequently decreased from 8.5% in 2008 (27) to 2.4% in 2012 (28).

After 2008, HIV messaging changed from 'practice safe sex' to 'know your status' – highlighting the fundamental role that HTS play within the HIV program. I would argue that this may have been the beginning of a move away from prioritizing counselling (individual behaviour change) as a prevention strategy to biomedical interventions to address the HIV epidemic. Initially, nurses conducted HIV testing in health facilities. Realizing the need to scale up HTS, health facilities shifted from only offering voluntary counseling and testing, whereby people actively seek out HTS, to include provider-initiated counseling and testing (PICT) (27). This is when healthcare providers recommend an HIV test to everyone attending the health facility regardless of whether they have symptoms of HIV (29).

In 2010/2011, South Africa undertook a successful national HIV testing campaign. This once-off campaign combined facility and community-based testing and increased the proportion of adults ever tested from 43.7% to 65.2% with approximately 7.6 million people testing for the first time (30). To assist with the increasing numbers of people who were testing, task shifting occurred and trained, lay HIV counselors were able to perform HIV rapid testing (31) under the supervision of registered nurses.

As HTS have evolved over time, there is ongoing debate regarding the efficacy of counseling as a risk-reduction intervention (32). There is some evidence that voluntary counseling and testing can

reduce HIV-related risk (33), but the benefit of HTS lies in the fact that it is the entry point to the HIV treatment cascade: the scaling up of HTS is therefore a prerequisite to the scale up of ART (34). The emphasis has shifted from counseling around safe-sex practices, to focusing on the HIV test result and discussion around appropriate evidence-based prevention interventions post testing (32). These interventions include pre-exposure prophylaxis (PrEP) (35), antiretroviral-based prevention (17), voluntary medical male circumcision (VMMC) (36) and harm-reduction services (37). This change in emphasis has resulted in a shift in terminology; initially ‘voluntary counseling and testing’ (VCT) became ‘HIV counseling and testing’ (HCT), which was replaced in 2015 by ‘HIV testing services’ (HTS). The changes at a global level, recommendations to scale up biomedical interventions to prevent the transmission of HIV, resulted in policy changes at a national level and ultimately changed the way in which HIV testing services were provided in the field. The removal of the word counselling signaled the end of the role of using counseling as a prevention measure. The new terminology (HTS) embraces the full range of services that should be included with testing: counseling, linkage to prevention, treatment and care services (38). The new terminology acknowledges that diagnosing HIV and/or TB is not sufficient; linkage to care and treatment is conditional to reduce the burden of disease.

The estimated number of new infections per year declined from 380 000 in 2010 to 270 000 in 2016 (3). While biomedical interventions are extremely important in HIV prevention, I would argue that de-emphasizing counselling, which aimed to change individual risk behavior, may have long-term repercussions. Individuals may be less likely to take responsibility for their health and look to biomedical interventions to reduce their risk. Making HIV a purely medical disease potentially ignores the fact that HIV is embedded within social and structural contexts that drive the epidemic and these socio-economic factors (poverty, substance abuse, gender-based violence etc.) need to be addressed if we are truly motivated to preventing the spread of HIV. HIV prevention should be a balance of biomedical and behavioural interventions.

1.1.2 Treatment

The ART roll-out began in 2004 (39). ART coverage progressively expanded, predominantly as a result of: (i) an increasing amount of international donor funding for HIV treatment between 2006 and 2011, largely distributed through NGOs (40); and, (ii) the health department increasing the CD4 threshold (27) from ≤ 200 cells/mm³ in 2004 (41) to ≤ 350 cells/mm³ in 2010 (42), allowing

those with higher CD4 counts to be eligible for treatment. Patients co-infected with TB were also eligible for ART from 2010 onwards (42). By 2011, 1.8 million persons were initiated on ART (43). Gradually young children were eligible for ART until in early 2015, access to ART was expanded to all children >5 years; adolescents; pregnant and breastfeeding women; those with Hepatitis B co-infection, irrespective of CD4 count; and, to adults with a CD4 count ≤ 500 cells/mm³ (44). In addition, ART was available to the HIV-infected partner of a sero-discordant couple (45). There were an estimated 3.9 million people on ART in 2016 (3). In September 2016, South African ART guidelines included the evidence-based policy of offering ART to all people living with HIV (5), thereby acknowledging the right of all HIV-infected South Africans to equal HIV care and treatment (46).

The studies included in this dissertation were designed, implemented and the results interpreted (2008-2016) during this continually shifting landscape, where guidelines have repeatedly changed to mirror the HIV response and terminology has been reformed and refined.

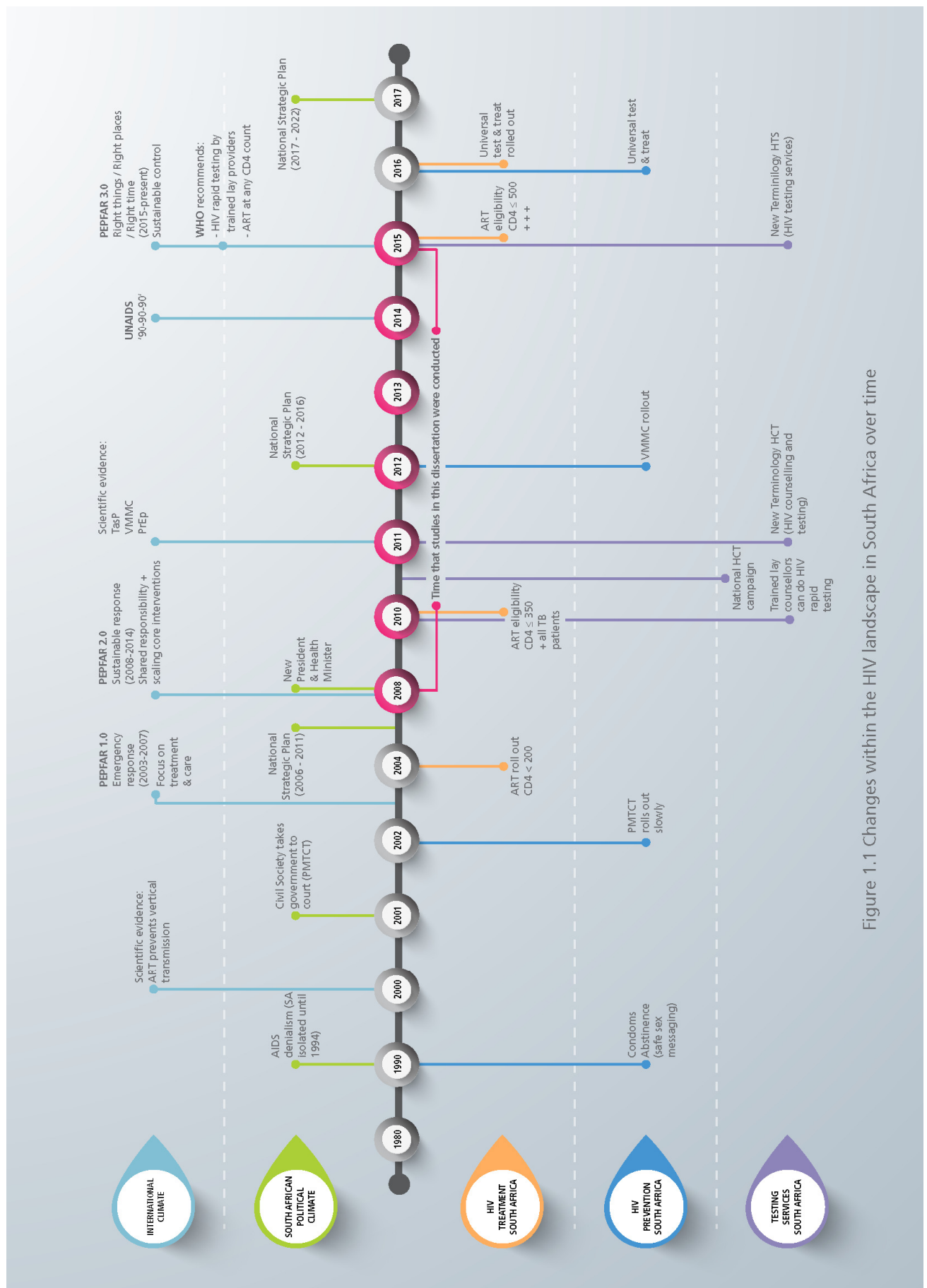


Figure 1.1 Changes within the HIV landscape in South Africa over time

1.2 THE NEED TO EXPAND HIV TESTING SERVICES

South Africa is currently working towards bringing the HIV epidemic under control, having adopted the UNAIDS '90-90-90' target: by 2020, 90% of all people living with the HIV should know their status; 90% of those with diagnosed HIV infection should receive sustained ART; and, 90% of all people receiving ART should have viral load suppression (16). Reaching the first '90' is vital for reaching the overall target, making HIV testing with linkage to care and treatment a vital component of any HIV program.

1.2.1 Public and private service providers

Health service provision, including the provision of HTS, can be public or private. Public services are provided by the government and produced for the benefit of the public at large and typically assume that 'one size fits all' (47). This means that public health services cannot easily accommodate individual needs and this may be one reason that not all populations access health facilities optimally (48). In working toward the first '90', there has been a drive to strengthen PICT in public health facilities (27) with healthcare providers routinely offering HIV testing as a standard component of medical care (46). This has worked well for increasing access to HIV testing for those who attend health facilities (49), for example women attending antenatal care or mothers bringing their children (46) and sick individuals, for example TB patients (50). A gap clearly exists for reaching populations who typically do not access public health facilities, for example males (51), youth (52) and those feeling 'well' and not aware of any signs or symptoms of disease (53).

Public health facilities, while essential, are unable to meet the UNAIDS target alone (48). This, together with the need to decongest health facilities (54), creates an opportunity to expand HIV testing outside of health facilities. Global organizations have emphasized community-based service delivery, which takes services closer to those who need them, thereby improving uptake (55)(19). This was echoed by the current South African Minister of Health, Aaron Motsolaedi, who said in 2016 that taking services closer to beneficiaries and communities will make it easier for people to take up these services (18). Community-based HTS may be a viable alternative to find HIV-infected individuals, get them diagnosed and refer them to public health facilities for HIV care and treatment.

Public health facility personnel sometimes provide community-based HTS on an outreach basis. These outreaches typically occur on an *ad hoc* basis; usually aligned to specific health awareness campaigns or to World AIDS Day. The sub-contracting of NGOs by government to

provide HTS outside of health facilities is one way to address the need to scale up HTS (56). It also reinforces the interconnectedness between government and civil society in South Africa's response to the HIV epidemic.

In South Africa, an NGO is a private organization established for public purposes (31). It is independent of (57) although registered with government. The World Bank defines NGOs as private organizations that pursue activities to relieve suffering, promote the interests of the poor and undertake community development (58). NGOs are typically strong on advocacy (59), which they use to influence policy (60). An NGO can receive public funding and/or donor funding to provide services, in addition to fundraising or private donations (57). Local NGOs that work at grassroots level, are often well entrenched within the communities in which they work and have a deep understanding of the local context (59), which is important when offering community-based HTS, to ensure contextual and cultural sensitivities. Community members may see local NGOs as part of their community (not as 'outsiders'), which is important for trust. The community needs to trust the service provider and know that the service provided benefits the community at large. It can take a long time to build up trust with all stakeholders in a community. Local NGOs, who have worked in communities for many years and have an existing trustworthy relationship with community stakeholders, are well placed to promote community-based HTS.

In addition, NGOs have the ability to be more flexible in terms of service provision and thereby respond to user needs more easily (47). For example, an NGO can provide HTS at a school on one day and at a taxi rank the next. However, although local NGOs may have the knowledge and understanding of communities and the desire to provide services to benefit the community, they may be limited in many ways (60) including structural and financial capacity. Limited management capacity may result in the same individuals being responsible for a variety of tasks across an array of programs. This is a challenge for optimal program management, monitoring and evaluation of services, and quality assurance. Funding is a continual challenge (61) and NGOs often rely on programmatic funding for their core activities and expenses, for example general management, human resources, rental and utilities. In addition, local NGOs may not be health program specialists. Typically, they implement a number of different, albeit related, social and health programs, which all require specific input and may have varied donor reporting demands. Despite these limitations, local NGOs remain well placed to deliver community-based HTS.

1.2.2 Community-based HIV-testing services

NGO-led community-based HTS provide HIV testing through alternative modalities; stand-alone (62)(63), home-based/door-to-door (64)(65)(66) and mobile offered within the community, at workplaces or educational institutions (67)(68)(69). Each of these modalities differ in terms of where the service is offered. Stand-alone is a fixed site, not attached to a public health facility. Door-to-door testing happens inside the user's home, with the homeowner's consent. Mobile consists of tents and/or a mobile van positioned in high traffic areas within the community, for example alongside busy thoroughfares or at transport hubs. The location of the mobile changes regularly. Each modality differs in terms of populations accessed, HIV yield, linkage to care and cost.

Overall, mobile is able to reach a higher proportion of men (38) compared to home-based and stand-alone modalities (48). Mobile reaches more males (67), youth (≤ 25 years) (70) and older individuals (≥ 31 years) (71) compared to public health facilities. Home-based testing reaches more adolescents (72) and youth (48) compared to mobile. First-time testers are more likely to be men and youth (67) and mobile and home-based testing reach more first-time testers than public health facilities (48) and stand-alone sites (73).

Men are an important population to reach for HIV testing services. It is well known that men compared to women are less likely to access health services, less likely to be diagnosed with HIV and start ART at more advanced stages of disease (74). Men have reported that they need testing services that are convenient (75). Other factors that limit their participation in HIV testing include fear of testing positive and issues around the concept of masculinity, including ideas that men are strong, in control and are not at risk of getting HIV (76).

HIV positivity is higher at public health facilities compared to mobile or home-based modalities (48). Stand-alone sites have a higher HIV yield compared to other community-based modalities (73)(77). Linkage to HIV care from public health facilities is estimated at 55% for PICT (48) and 60% for self-initiated testing (78). Linkage to care from mobile HTS in Cape Town was reported as 53% (79). In sub-Saharan Africa, estimated linkage to care at mobile (38%) is higher compared to home-based HTS (27%) (48). Although, linkage to care remains less than optimal at all modalities, it significantly improves with counselor follow up and support (48).

A meta-analysis of community-based modalities showed the cost per person tested ranged from \$2 to \$126 (80). The South African HIV and TB Investment case reports the overall estimated cost per person tested is lower at mobile (\$8-\$10) compared to home-based (\$10-\$12) (18). These results differ from studies in other African countries where the cost per person tested at mobile (\$24-\$27) is higher than home-based HTS (\$9-\$11) (72)(48). Although little cost data exist for stand-alone; a Kenyan study found the cost to identify an HIV-positive individual was lower at mobile (\$15) compared to stand-alone (\$27) (81). Comparing the cost of community-based HTS to PICT at public health facilities in South Africa; PICT cost \$7 for an HIV-negative result (less than mobile and home-based) and \$11 for a positive result (higher than mobile and home-based) (18). It is difficult to compare costs across studies in US dollars because of fluctuating exchange rates, as well as different factors included in these studies.

1.2.3 Drivers and barriers to HIV testing

Although the proportion of undiagnosed HIV-positive adults has declined from around 80% in 2000 to 23.7% in 2012 (51), testing coverage remains low for certain populations, including men and younger individuals (30). Availability of HTS does not necessarily translate into utilization of the services.

Multiple barriers exist to HIV testing. Numerous barriers that prevent HIV testing at public health facilities have been reported including: long waiting times (82), poor staff attitudes (83) and travel costs (84). In addition, fear of testing positive (85) and fear of being seen at an HIV testing facility (85) have been reported. Reported fear may be indicative of underlying stigma, which is well documented in the literature (86)(87)(88) as a barrier to HIV testing, as is low HIV risk perception (69). Those who have never tested for HIV and are not interested in testing are more likely to report not knowing where to test, have a lower perceived risk for getting HIV and less positive attitudes towards individuals living with HIV, compared to those who are interested in testing (89). Going forward, health service providers must understand the health-seeking behavior of those who remain untested and undiagnosed.

In addition, it is also important to be aware of what facilitates access to HIV testing. South African studies indicate different reasons that drive individuals to test for HIV including: a deterioration in health (90); fear that they may have HIV (91); accessible testing services (92); and, having talked to someone about HIV/AIDS (93). Understanding drivers and barriers to HIV testing facilitates an understanding of the health-seeking behavior, including the needs of

potential users. This can assist health service providers to offer HTS in line with these needs, to increase test uptake, especially for those unaware of their HIV-positive status.

1.2.4 The need for an integrated approach

As treatment and treatment as prevention become pivotal in working toward ending the HIV epidemic, it's important not to focus on a health system that ends at the public health facility and disregards community-level services(94). Community-based prevention and treatment services should be part of an integrated public health approach (19), with formal collaboration among public and private service providers, including non-governmental sectors (46). Offering HTS inside public health facilities and from alternative modalities in communities where people live and work increases the utilization of HTS and ultimately the number of people who know their HIV status.

As South Africa strives toward the '90-90-90' target; reaching the first '90' (finding 90% of individuals who are unaware of their HIV-positive status) is essential, making it necessary to increase access to HTS. Community-based HTS are one way to reach populations who do not access public health facilities. As described above, there is information regarding who utilizes community-based HTS, the HIV yield and cost, as well as the benefits and limitations of NGOs as service providers. However, there is a lack of information giving an overall perspective of access beyond mere utilization.

1.3 UNDERSTANDING ACCESS

Understanding access to healthcare is important for health services research (95). There is a wide body of literature on this topic as well as a variety of definitions and conceptual frameworks for understanding access with different dimensions for measuring access, demonstrating that access is a complex and multidimensional concept (96).

Access is sometimes used in a narrow sense where it refers only to utilizing a service (97), but in this dissertation we consider the broader definition of access that relates to the opportunity for access and the related costs and benefits (98). While some have argued that access can be evaluated by looking at utilization rates or the user's satisfaction with the system (97), others have suggested a more encompassing approach, conceptualizing access as a relationship or interaction between the health system and individuals or communities (99). This also means that access is not an aggregated concept, but specific to the characteristics of the users versus the characteristics of the service provider (97).

Penchansky and Thomas describe access as the ‘degree of fit’ between the user’s needs and the service providers’ ability to meet those needs (95). This concept refers to a two-directional interaction: the health systems’ interaction with individuals and individuals’ interaction with the health system (98). They describe access along five dimensions; availability, accessibility, accommodation, affordability and acceptability, but focus on the interaction of these dimensions (100). One challenge with this framework is that these five dimensions are not completely distinct, making them difficult to measure. Availability (the volume and type of service on offer in relation to the users’ needs for these services) can easily overlap with accessibility (relationship between the location of the user and the service) – both dimensions relate to coverage. Accommodation (the manner in which the services are organized and supplied in relation to the users’ perception of how appropriate these are) overlaps with acceptability (the users’ attitudes about the service providers’ characteristics in relation to the actual characteristics of the service provider) - both dimensions incorporate user perceptions of the service. Affordability appears to be a more distinct dimension, the relationship between the cost of services and the users’ ability or willingness to pay.

Many theorists have taken the work of Penchansky and Thomas further and developed frameworks with dimensions that are more distinct and therefore easier to measure (101)(102)(103). This dissertation uses a framework presented by Thiede, Akweongo and McIntyre (2007) comprising three mutually exclusive dimensions; availability (physical access), affordability (financial access) and acceptability (cultural access) (98). In 2009, McIntyre, Thiede and Birch, presented this theoretical framework as relevant for addressing access to healthcare in low- and middle-income countries (104), including South Africa, where improving capacity to meet the healthcare needs of populations is a priority (104), in order to create more equitable access to public healthcare (105).

1.4 FRAMEWORK TO MEASURE ACCESS

The framework put forward by Thiede, *et al.* (98) is useful for this dissertation, as it clearly identifies three mutually exclusive dimensions along which access can be measured. This provides a useful basis for evaluation, as each dimension can serve as an entry point for analyzing the interaction between the health system and individuals (98). In addition, it offers some factors that may influence each dimension (98).

Both Thiede, *et al.* (2007) and McIntyre, *et al.* (2009) conceptualize the three mutually exclusive dimensions of access as follows (98)(104);

- Availability (physical access): concerned with the appropriate healthcare providers or services being supplied in the right place at the right time to meet the prevailing needs of the population. Some factors that influence availability include: how far individuals need to travel, transportation options, and service hours.
- Affordability (financial access): concerned with the ‘degree of fit’ between the full costs to the individual of using the service and the individual’s ability to pay in the context of the household budget and other demands on that budget. Some factors that influence affordability include; healthcare costs, transportation costs, and loss of income while travelling to and utilizing the health service.
- Acceptability (cultural access): concerned with the nature of the service and how individuals perceive it. It is the degree of fit between the attitudes of providers and individuals, influenced by age, sex, language and socio-economic status. Some factors that influence acceptability include: healthcare worker attitudes, waiting times, and the manner in which the service is organized.

This framework allows access to be evaluated directly instead of focusing on utilization as a proxy for access. Utilization is the observed outcome of the accessibility of an HTS and may provide an incorrect perception of access; high levels of utilization may be due to desperation or a lack of alternative services. Instead, utilization should be viewed as an indication that access is adequate; individuals may utilize a service even though it may impose unnecessary and huge burdens on them. While access is about the interaction of the health system and the user, utilization does not provide any indication about this, nor does it reflect the appropriateness of the service for the user (106). As such, access is not the same as utilization.

The framework conceptualizes access in relation to each of the three dimensions, understanding access as the interaction between these three distinct dimensions (98). Access will be realized if all dimensions are addressed and both healthcare system and individual perspectives are taken into account (104). When a potential user perceives the health system to be available, affordable and acceptable, the individual will feel empowered to utilize the system and access will be realized.

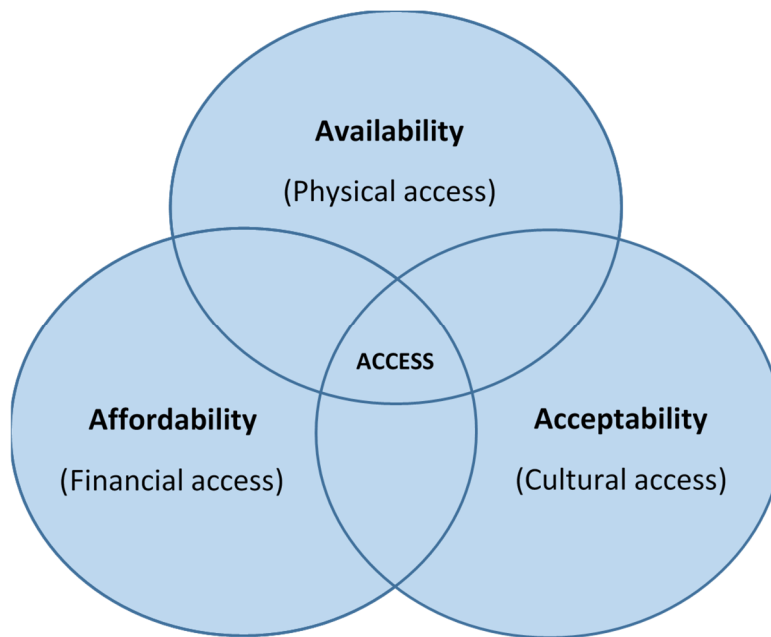


Figure 2: Schematic representation of the framework put forward by Thiede *et al.* (2007) (98)

The level of access is determined by the 'degree of fit' between individuals or communities and the health system (107). A service may be in close proximity to the potential user (available), who can afford to pay the various costs associated with utilizing the service (affordable), but if the potential user perceives confidentiality and privacy may not be upheld (acceptable), they may not access the service. Similarly, if a potential user perceives a service to be acceptable and can afford the costs involved in utilizing the service (affordable), but is unable to attend the service on the days it is offered (available), then they may not access the service. These examples highlight the interplay between the user and service provider and the importance of the 'degree of fit' between the user and the health system.

I chose this theoretical framework because the three dimensions of access can be easily applied to any health system; public or private. While each dimension of access can be independently measured, the framework still allows for their inter-relatedness to be understood. Specifically, the overlap between availability and affordability, the overlap between availability and acceptability and the overlap between affordability and acceptability can all be explored. There has been limited application of this framework with only one study applying the affordability dimension to public health services (105). Applying this framework to an NGO-led health service would therefore be unique. The framework is limited in that it can only take into

account health system factors that affect access. The psycho-social factors that drive an individual to test for HIV, for example an awareness of signs or symptoms of disease or knowing someone who has died from HIV, cannot be considered in this framework, as they are not directly linked to availability, affordability or acceptability.

1.5 RATIONALE FOR THIS DISSERTATION

The research done for this dissertation is important as South Africa works toward the '90-90-90' target. This dissertation falls directly within the first '90' and partly within the second '90'. Merely having HTS available does not necessarily result in uptake of services. While studies have shown that offering HIV testing from alternative testing modalities does result in utilization by different populations, there is limited understanding of what constitutes access, and why many individuals remain untested and undiagnosed. Published studies predominantly address utilization of HTS (demographic characteristics/clinical outcomes of CB modalities vs. public facilities). There is a paucity of evidence around determining actual access to HTS.

The findings will contribute to a deeper understanding of access and provide important lessons about access that can be used to strengthen health services; specifically for increasing access to HTS. Using a framework that conceptualizes 'access' as an interconnectedness between user and service provider, the findings will identify the important role that health services play in expanding access.

The current challenge in the HIV prevention research arena is translating evidence into effective and sustainable HIV programs (108). Clinical research studies provide answers to questions, but findings do not typically translate into operational changes. Although there has been a shift toward operational research to build evidence for different models of HTS to determine costs and social impacts (108)(109), there remains limited data on access to HTS from an operational perspective. Operational research is ideally suited to the search for knowledge on interventions (110) that are cost-effective, efficient and effective (108) in routine settings, especially in low-income countries, where disease burden is high and resources and time are limited (110). This dissertation uses operational research, so that the findings can be easily translated into practical recommendations for easy adoption at program level.

Specifically addressing access to community-based HTS, this dissertation will evaluate the contribution that NGOs can make in terms of increasing access to HIV testing through the provision of a specific community-based HIV counselling and testing (CB-HCT) initiative. As

the NGO-led CB-HCT initiative's accessibility has never been rigorously evaluated, this research provides a scientific evaluation of this initiative and the role it plays in increasing access to HTS.

1.6 THE COMMUNITY-BASED HIV COUNSELING AND TESTING INITIATIVE

The Desmond Tutu TB Center (DTTC) at Stellenbosch University, in partnership with NGOs implemented a community-based HIV counseling and testing (CB-HCT) initiative comprising two HTS modalities; stand-alone centers and mobile services. The DTTC selected NGOs through a tender process, with successful NGOs demonstrating good financial and management capacity, as well as relevant experience working in high HIV burden communities around Cape Town. These NGOs were a mix of faith-based and community activist organizations.

The CB-HCT initiative was implemented in eight communities in the Cape Metro district. A different NGO worked in each of the eight communities, where they established a stand-alone center and mobile service in the same community. Overall, in each of the eight communities, HIV testing was offered from a stand-alone and mobile service weekdays during standard business hours (08H00 to 16H30).

Core staffing was identical in each community in which the CB-HCT initiative was implemented; consisting of a coordinator, a professional nurse, an enrolled nurse, three HIV lay counselors and a security person/driver. The day-to-day logistics, management, and monitoring and evaluation of services were the responsibility of the coordinator and professional nurse. The enrolled nurse provided the majority of the clinical services under the supervision of the professional nurse, who provided clinical services when required. The HIV lay counselors provided pre- and post-test counseling and HIV rapid testing. The security person/driver was responsible for escorting the mobile services team. The nurses were employed by Stellenbosch University and seconded to the NGO. Each NGO directly employed all other staff.

Stand-alone centers (fixed sites) were located in rented retail space or within the NGO premises. HIV counselors had their own private counseling room, set up with all necessary supplies and educational materials. In some stand-alone centers, nurses had their own room dedicated to clinical services, while at other stand-alone centers, the nurses provided clinical services in the counseling rooms, using a trolley to transport necessary supplies. Each stand-alone center had a dedicated waiting area, a kitchen and a bathroom. Individuals were able to

walk into a stand-alone center without an appointment and request any of the services provided as part of a comprehensive 'HCT service package'. Services included HIV testing, TB and sexually transmitted infection (STI) symptomatic screening, TB testing, screening for non-communicable diseases, pregnancy testing, assessment of family planning needs, general health education and referral to health facilities for relevant care and treatment. Individuals voluntarily consented to an HIV test. HIV and TB testing were done in accordance with provincial algorithms and guidelines. An HIV diagnosis was made when both the screening and confirmatory rapid tests were positive. Discordant results were confirmed with a laboratory ELISA (Enzyme Linked Immunosorbent Assay) test performed by the National Health Laboratory Service (NHLS). Users received their HIV test result during post-test counseling. HIV-positive users were referred to a public health facility for HIV care and followed up to determine if they had successfully linked to care. At least three attempts were made to determine linkage to care, which was self-reported. Users who did not want an HIV test could still access the other services.

Mobile services consisted of 'pop-up' tents and a caravan (mobile van) that were set up in the community near transport hubs, on open fields or along main thoroughfares. The HCT team selected these sites on an *ad hoc* basis and these sites changed regularly. Each HIV counselor had his or her own tent for counseling and testing. The tents were positioned to ensure privacy (not too close so that conversations could be overheard), but close enough for security purposes. A folding table and two folding chairs were set up in each tent. HIV counselors had their own supplies, laid out on the table. The nurse typically provided clinical services (other than HIV testing) in the mobile van. An informal outside waiting area was set up with folding chairs positioned in rows. A security person would be close by to oversee the safety of staff and potential users. The mobile provided exactly the same package of services by the same cadre of staff, as at stand-alone centers.

Standard operating procedures (SOPs) were the same at both modalities. These included SOPs for the HIV testing process, taking a TB sputum, health and safety, collecting routine data, quality assurance for HIV rapid testing, etc. Quality assurance was conducted for HIV rapid testing. Initially ELISA laboratory tests were used to validate rapid test results. Later we implemented practices in line with CDC recommendation. This included regular internal and external proficiency testing evaluations for healthcare workers and independent quality control. Temperature control measures for HIV rapid test kits were implemented as well as strict stock

control measures. Various monitoring and evaluation (M&E) practices ensured a standardised quality service across all stand-alone centers and between services provided at stand-alone centers and on a mobile basis to ensure that users received an identical service irrespective of which HTS modality they accessed. These M&E practices included a bi-annual audit of counselling and testing records to ensure accuracy and completeness of records and to ensure the correct processes were followed. Quarterly infection control audits and counsellor competency evaluations were carried out. All staff training was in line with department of health training. The HIV testing algorithm and guidelines were the same as those used by the health department.

With both modalities offering the same service package and following the same processes, the main differences were infrastructure and location. At the stand-alone, a potential user needed to travel to the fixed site to utilize the service. When the mobile service was set up in a communal space, people who saw the tents, usually because they were walking past were able to utilize the service.

While NGOs were responsible for service implementation, DTTC was responsible for the overall management of the CB-HCT initiative, ensuring contractual obligations to the funder, providing technical assistance to the NGOs (training, mentoring and funding), data management and overall financial management. DTTC allocated equal funding to each NGO, for implementation of services. Each NGO was required to meet the same output targets, including the number of users counseled and tested for HIV, and the proportion linked to HIV care and treatment. DTTC monitored NGO expenditure and progress toward targets on a quarterly basis through the timely submission of financial and narrative reports by each NGO.

Each NGO was awarded the same level of funding based on the cost to implement community-based HTS in order to achieve a targeted number of HIV tests. DTTC implemented strict financial controls. NGOs received funding at the beginning of each quarter. At the end of each quarter, prior to receiving their next tranche of funding, NGOs had to submit a financial report, detailing all expenditure for that quarter. Supporting documentation was required for all expenditure, for example salary slips for staff, receipts, proof of payment advices, etc. The designated person at DTTC checked: (i) that all expenditure was allowable in terms of the budget; (ii) all expenditure was reasonable (for large purchases, NGOs had to show that they had received more than one quotation and motivate if they had not used the lowest quotation); and, (iii) that the total expended for each cost category did not exceed the total budgeted. NGOs

not utilising all their quarterly funds, received a proportionally lower amount of funding the following quarter. In this way, tight financial controls were maintained. This mitigated the risk of potential unauthorised expenditure and ensured that accountability for the funding received remained paramount. In addition, this meant that the designated person at DTTC had a detailed perspective of what costs were involved in expending HTS and the costs associated with NGOs implementing HTS through stand-alone centers and on a mobile basis.

1.7 OVERALL AIM

The overall aim of this dissertation is to determine access (availability, affordability and acceptability) of a community-based HIV counseling and testing (CB-HCT) initiative implemented in Cape Town, South Africa. As linkage to care is part of HIV testing services, one chapter in this dissertation includes linkage to care.

1.8 RESEARCH METHODOLOGY

1.8.1 Setting

The research took place within communities situated in the Cape Metro district of the Western Cape Province. The Western Cape province of South Africa has an estimated HIV prevalence of 5.3% in the age group 15-49 years, with large variations across districts and sub-districts (111). Within this province, HIV/AIDS and TB account for the highest burden of premature mortality (111). Possible contributing factors include poor levels of education, transactional sex, migration from areas of higher HIV prevalence, poverty and unemployment (111).

The Cape Metro district is one of 28 high-burden districts for HIV identified by the National Department of Health (15). This district accommodates 66% of the provincial population (7). HIV testing is offered at over 100 primary healthcare facilities, 13 hospitals and by approximately 24 community-based organizations (112). Antenatal prevalence ranges between 9% and 37% across health sub-districts (36). The eight communities included in this research are all under-developed, densely populated, have a mixture of formal and informal dwellings and are characterised by high unemployment, socio-economic challenges and a high HIV and TB burden (112). Poverty is rife, with many households not having access to piped water inside their homes nor flushing toilets, resulting in them having to queue with buckets for water. Many homes have backyard dwellings, adding to overcrowding. There are very few recreational places (sports fields, playgrounds), which results in many children, youth and adults 'hanging around' on the streets, making them vulnerable to gangs. The majority of people are dependent

on public transport. With many individuals walking to and from transport hubs, an opportunity is created to deliver mobile health services. Shebeens (informal drinking places) are plentiful. They increase easy access to alcohol, which plays a direct role in the high crime rates in these communities, including gender-based violence. I believe that HIV is as much a social disease as a medical disease, driven by social inequalities. HIV-positive individuals are concentrated among the lowest socio-economic quintiles (7). Unless we address the social determinants of HIV, it is unlikely that we will be able to completely end this epidemic. It is also important that we study access to HIV services within these communities, as access is impacted by these social and structural issues.

The eight communities were purposively chosen in collaboration with local health services. These communities were identified as having high HIV burden, but lacking HTS, other than that provided from public health facilities. Due to cost and resource constraints, it was not possible to collect data in all eight communities for every study. Although the number of communities included in each study differs, all study communities are similar in terms of socio-economic status and disease burden.

1.8.2 Design

Overall, this dissertation uses a mixed-methods approach including quantitative and qualitative studies, as well as a cost-analysis study. The dissertation falls within the realm of operational research and the studies within this dissertation used methods typical of operational research namely descriptive and cohort studies (110). The specific design of each study is discussed in each chapter. All studies took place between 2008 and 2015.

1.8.3 Participants

The studies that utilized routinely collected anonymized data, included data from all individuals ≥ 12 years of age, who self-initiated an HIV test at the CB-HCT initiative. The age of consent for an HIV test in South Africa is 12 years.

The studies that required participants to complete a survey, a questionnaire or to be interviewed, enrolled participants who were ≥ 18 years and who had self-initiated for an HIV test at the community-based HCT initiative (mobile or stand-alone service) or at a public health facility. Age of consent for research studies in South Africa is ≥ 18 years. Each study enrolled participants at different points within the HIV testing service; either during or immediately

after they had completed the HTS (before they left the service) or up to one month after they had accessed HTS.

1.8.4 Data sources

Some studies utilized routinely collected health services data from the CB-HCT initiative, while others collected study data directly from participants who utilized either the CB-HCT initiative or a public healthcare facility. Both retrospective and prospective data were collected between January 2008 and December 2015.

1.8.5 Data management

Data were collected both in hard copy and electronically. Hard copy forms include the participant informed consents, participant questionnaires, and client record forms (routinely collected for every client who accessed the CB-HCT initiative). Electronic data include interview recordings and electronic questionnaires. All data were managed and stored confidentially.

Data collected in hard copy were entered into specially designed databases, unique to each study. The routinely collected client data from the CB-HCT initiative were entered by two independent data clerks; each captured the same source document into two independent datasets. A data manager checked these two independent datasets against each other and any discrepancies were corrected by a third data clerk after checking the source documentation. A final validated dataset was locked for analysis.

All hard copy forms are stored in locked cupboards at the DTTC. Once a study is complete, the hard copy documents are transported to an off-site company that specializes in the secure document storage. All boxes are catalogued and an inventory is retained at DTTC. All electronic databases are password protected and encrypted to ensure no personal participant information is visible. The electronic data are stored on a central server and backed up regularly.

1.8.5 Ethics approval

All studies were approved by the Health Research Ethics Committee of Stellenbosch University (S12/02/059, N10/09/288 and N08/10/307) and conducted according to the Helsinki Declaration. In South Africa, the age of consent for an HIV test is ≥ 12 years. Individual consent for an HIV test was taken from all users' who accessed the CB-HCT initiative. The routinely collected health data for users were aggregated in a dataset that did not contain any individual

user identifiers. The dataset only included those ≥ 12 years. A waiver of consent allowed the routinely collected aggregated data to be analysed.

In South Africa, age of consent for research studies in South Africa is ≥ 18 years. Participants enrolled in a study, which required them to complete a survey, a questionnaire or to be interviewed, were ≥ 18 years. They all provided written informed consent, which allowed them to withdraw from the study at any time. Non-participation in the studies did not affect them accessing an HIV test or any of the related services. Participants never received any incentives to take part in any study.

Permissions were obtained from the Cape Town City Health Directorate and the Western Cape Government Department of Health.

1.9 OVERVIEW OF THIS DISSERTATION

In order to address availability, affordability and acceptability of the CB-HCT initiative, I included the following chapters in this dissertation.

In Chapter 2, I asked the following research questions:

- Do mobile HTS attract a different population of users compared to public health facilities?
- What are the self-reported reasons for users choosing a particular service provider for an HIV test?

These were answered by comparing the characteristics of users who accessed either a mobile HTS (part of the CB-HCT initiative) or a public health facility for an HIV test. The study was conducted in eight communities around Cape Town in 2011 and enrolled 1063 participants. The findings provide reasons why participants chose to access either HTS and identify some key differences in accessibility and acceptability between the two service modalities. Overall, this chapter addresses availability, affordability and acceptability

In Chapter 3, I asked the following research questions:

- What are the reasons that users choose to have an HIV test?
- Why did users choose either a mobile service or a public healthcare facility for an HIV test?
- What was the client's experiences of HTS at a mobile service and a public healthcare facility?

These questions were answered by describing the experiences of users who accessed either a public healthcare facility or a non-governmental mobile service (part of the CB-HCT initiative) for an HIV test. This qualitative descriptive study took place in two communities around Cape Town in 2011. A total of 16 participants were interviewed. They provided reasons why they decided to test for HIV, why they chose a particular service provider and their experience of healthcare worker attitudes, waiting times, privacy and stigma. This chapter addresses availability, affordability and acceptability.

In Chapter 4, I asked the following research question:

- What is the availability, affordability and acceptability of the NGO-led mobile and stand-alone services compared to public healthcare facilities?

This question was answered by comparing availability, affordability and acceptability of HTS at three HTS modalities; an NGO-led mobile service, an NGO-led stand-alone center (both part of the CB-HCT initiative) and a public healthcare facility. A cross-sectional survey enrolled 130 participants in one purposively selected community around Cape Town in 2014/2015. The findings provide information about the geographical accessibility, user affordability and overall acceptability of each HTS modality, from the participants' perspective.

In chapter 5, I asked the following research questions:

- What are the reasons that first-time testers give for never having tested for HIV previously?
- What are the reasons given by those who have never tested for HIV previously, to now test for HIV?

These questions were answered by describing self-reported drivers and barriers to HIV testing, as reported by first-time testers. This cross-sectional prospective study enrolled 229 first-time testers who self-initiated an HIV test at the CB-HCT initiative in five communities around Cape Town in 2015. Participants completed an electronic questionnaire, providing reasons why they had never tested for HIV previously and why they decided to access the CB-HCT initiative for an HIV test now. This chapter addresses availability and acceptability.

In chapter 6, I asked the following research questions:

- What are the factors associated with linkage to HIV care and TB treatment at community-based HTS in Cape Town, South Africa.

This question was answered utilizing the routinely collected programmatic data collected between 2008 and 2012 at the mobile and stand-alone services that formed the CB-HCT initiative. This retrospective cohort study included 79 545 client records to determine if sex, age, HTS or co-infection were associated with linkage to HIV care for those diagnosed with HIV and linkage to TB treatment for those diagnosed with TB. This chapter highlights an association between HIV testing service and linkage to HIV care, which allows for a discussion around health seeking behavior.

In chapter 7, I asked the following research question:

- What are the overall costs of stand-alone and mobile services?
- What are the costs per cost category (personnel, capital goods and recurring goods/services) at stand-alone and mobile?
- What are the costs per program component (administration, capacity building, monitoring and evaluation, data, planning, direct service provision and overheads) at stand-alone and mobile?
- What is the mean cost per HIV output (tested, diagnosed and linked to care) at stand-alone and mobile?

This costing study provides a comprehensive account of the overall cost of the CB-HCT initiative, aspects of the CB-HCT initiative that drive costs overall and the mean cost per HIV output for the mobile and stand-alone services (both part of the CB-HCT initiative). Cost data were collected in 2014 in one community around Cape Town. This chapter allows for a discussion around the scalability of the CB-HCT initiative, from a cost perspective.

Chapter 8 presents a synthesis of the main findings from chapters 2 to 7, as it describes the socio-economic status and demographics of the users in our setting and addresses the availability, affordability and acceptability of mobile and stand-alone HIV testing services (CB-HCT initiative). After discussing health-seeking behavior and considering issues around scale up of the CB-HCT initiative, this chapter addresses the overall strengths and limitations of this dissertation. Finally, the chapter provides evidence-based lessons learnt for program implementation and discusses what this dissertation contributes overall to the scientific knowledge base, before providing an overall conclusion. Throughout the chapter, gaps in knowledge and opportunities for future research are identified.

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CHAPTER 2: CHARACTERISTICS OF CLIENTS WHO ACCESS MOBILE COMPARED TO CLINIC HIV COUNSELLING AND TESTING SERVICES: A MATCHED STUDY FROM CAPE TOWN, SOUTH AFRICA

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My contribution to this study: I am first author on this manuscript. I conceived of and designed the study. I employed and trained the research assistants and managed the overall process of data collection. I worked closely with the statistician for the analysis and took responsibility for the interpretation of the data. I wrote the initial manuscript, made revisions as per co-author suggestions and submitted the manuscript for publication. N. Beyers supervised me throughout the process. All other co-authors provided input into the study design, analysis and data and interpretation. C. Lombard was the statistician. All authors read, gave comment and approved the final manuscript.

ABSTRACT

Background: Studies within sub-Saharan African countries have shown that mobile services increase uptake of HIV counselling and testing (HCT) services when compared to clinics and are able to access different populations, but these have included provider-initiated HCT in clinics. This study aimed to compare the characteristics of clients who self-initiated HCT at either a mobile or a clinic service in terms of demographic and socio-economic variables, also comparing reasons for accessing a particular health service provider.

Methods: This study took place in eight areas around Cape Town. A matched design was used with one mobile HCT service matched with one or more clinics (offering routine HCT services) within each of the eight areas. Adult clients who self-referred for an HIV test within a specified time period at either a mobile or clinic service were invited to participate in the study. Data were collected between February and April 2011 using a questionnaire. Summary statistics were calculated for each service type within a matched pair and differences of outcomes from pairs were used to calculate effect sizes and 95% confidence intervals.

Results: 1063 participants enrolled in the study with 511 from mobile and 552 from clinic HCT services. The proportion of males accessing mobile HCT significantly exceeded that of clinic HCT ($p < 0.001$). The mean age of participants attending mobile HCT was higher than clinic participants ($p = 0.023$). No significant difference was found for socio-economic variables between participants, with the exception of access to own piped water ($p = 0.029$). Participants who accessed mobile HCT were significantly more likely to report that they were just passing, deemed an opportunistic visit ($p = 0.014$). Participants who accessed clinics were significantly more likely to report the service being close to home or work ($p = 0.035$).

Conclusions: An HCT strategy incorporating a mobile HCT service, has a definite role to play in reaching those population groups who do not typically access HCT services at a clinic, especially males and those who take advantage of the opportunity to test. Mobile HCT services can complement clinic services.

BACKGROUND

South Africa has an AIDS epidemic with primarily heterosexual transmission [1]. HIV prevalence in South Africa is 18% among the general adult population and 30% among pregnant women. The total number of people living with HIV continues to grow [1]. Within the Western Cape Province of South Africa, the estimated HIV prevalence in the age group 15-49 years has increased from 5.2% in 2008 to 9.2% in 2012 [2]. There are significant variations at district and sub-district level with possible contributing factors including poor levels of education, transactional sex, migration from areas of higher HIV prevalence, poverty and unemployment [3].

The government's National Strategic Plan on HIV, STIs and TB (2012-2016) is a coordinated response to this epidemic, with the aim of reducing the number of new HIV infections by 50% and ensuring that at least 80% of people who are eligible for treatment for HIV are receiving it [4]. Knowing one's HIV status is key to achieving these goals and is a key component of HIV care and prevention [5-7]. HCT also encourages safer sex and is an entry point for HIV care and treatment services

Demographic and socioeconomic factors have been associated with HIV risk. Unmarried men have been shown to be at highest risk for HIV followed by unmarried women [8]. Individuals who are divorced, separated or widowed tend to have higher HIV prevalence [9]. Educational attainment can be associated with lower risk of HIV infection [10]. Poverty and those living in informal settlements has been shown to be a social determinant for HIV infection [11,12].

Understanding the characteristics of clients who self-initiate for HCT can assist to identify if high risk individuals are accessing services. Studies have looked at different strategies of HCT within sub-Saharan Africa and have shown that mobile or home-based services, compared to clinics, increase uptake of HCT [13-15], can reach the largest proportion of previously untested people [16-18] including males [18-20], across age groups [18,19,21], working people [22] and less educated populations [21]. Mobile HCT was also deemed to be convenient, confidential and credible [23,24]. However

these studies have included all categories of clients attending clinic HCT, including those referred for HCT by a health professional.

This study aimed to compare the characteristics of clients who self-initiated HCT at either a mobile or a clinic service in the Cape Town district of the Western Cape Province of South Africa. We wanted to determine if mobile services attracted a different population of clients. We also assessed the reasons for clients choosing the service.

METHODS

Study areas

Community HCT centers were established in 2008 by the Desmond Tutu TB Center (DTTC) at Stellenbosch University in partnership with non-governmental organizations (NGOs), in eight high HIV and TB burdened communities within the Cape Town health district of the Western Cape Province of South Africa. The settings varied with some centers in shopping malls and others in residential areas. Staff provided HCT either from the community HCT centers or on an outreach, mobile basis. The latter entailed services being provided from pop-up tents and a caravan (mobile van) in an appropriate open space, including taxi ranks or train stations, on open fields, next to main routes or close to public meeting places. Mobile services were offered during standard clinic operating hours during the study period.

During HCT, clients underwent pre-test counselling; received education, were symptomatically screened for TB and STIs, family planning needs were assessed and consent for an HIV test was taken. Both HIV and TB testing were conducted in accordance with national algorithms. A client was diagnosed with HIV if both the screening and confirmatory rapid tests were positive. Discordant results were confirmed with a laboratory ELISA HIV test. Clients received their HIV test result during post-test counselling. HIV positive clients were referred to the clinic of their choice for ongoing care. Trained HIV lay counsellors provided counselling and a nurse provided clinical services and HIV testing. Monitoring and evaluation activities, including a bi-annual audit, ensured standardized quality services.

The HCT process in clinics differed. The ACTS (advise, consent, test, support) model was used. Pre-test counselling is abbreviated, allowing counselling to be delivered within a few minutes to enable providers to integrate HIV testing into routine care. Issues specific

to the clients HIV status as well as aspects typically dealt with during pre-test counselling are addressed during post-test counselling. Clients who were diagnosed as HIV positive were referred to HIV services. Trained HIV lay counsellors provided both the counselling and the HIV testing.

The eight geographical areas in which the study took place are under-developed, densely populated peri-urban areas, with high unemployment rates and high TB and HIV disease burden.

Design

A matched design, comparing mobile with clinic HCT services, within a geographically defined area, was utilised. A 2 km radius was plotted around each of the eight community HCT centers to circumscribe eight geographical areas. All clinics within these geographical areas were included with between one and five clinics matched to each mobile service. There was no overlap between these eight areas. Only services within these areas were included in the study.

Definitions

Mobile HCT: HIV counselling and testing services provided on an outreach basis by a local non-governmental organization.

Clinic HCT: HIV counselling and testing services provided within a primary health care clinic.

Self-initiated HCT: Individuals who actively seek HIV testing and counselling at a facility that offers these services [5].

Provider-initiated HCT: HIV testing and counselling that is recommended by health care providers [5].

Study population

This study included clients who self-initiated (actively sought an HIV test) to either the mobile HCT service or one of the clinics within each of the geographically defined areas. Clients who received provider-initiated HCT at clinics were excluded. All adult clients (18 years of age or older), irrespective of their place of residence, were invited to participate in the study. Clients were enrolled sequentially, after they had completed HCT, until the target number for each service and area was reached. The study could not differentiate between clients who refused participation and those who were not

referred by HCT counsellors. These clients were identified through the routinely collected data.

Sample size

To show a significant gender differential, we assumed 60% of participants being tested in mobile services are male versus 40% in the clinics, based on routine data. With a two-sided confidence interval of 95% and power of 80%, the required total sample size was 960 for the eight areas. This equated to a total of 120 participants per area (60 from mobile and 60 from the clinics). Equal numbers of participants were enrolled from the clinics within an area. In two areas, with more than three clinics a minimum of twenty participants per clinic were enrolled.

Methods

A questionnaire was developed to collect data on demographic and socio-economic variables, as well as reasons for accessing a particular health service provider. The questionnaire was translated from English into Afrikaans and isiXhosa and back translated into English by two different linguists and piloted in the same communities. The pilot data were not included in the study. Enrolment took place between February and April 2011. Written informed consent was obtained from each participant, with the option to leave the study at any point. The questionnaire was administered by trained research assistants at the site after completion of HCT.

Analysis

Summary statistics were calculated for mobile and clinic HCT services within each geographical area. A matched pair consisted of all the clinics compared to the mobile service within a geographic area. A matched pair analysis was done, taking the differences within each pair and calculating the mean of the differences across pairs, to estimate the effect size and confidence interval. A permutation test was used to evaluate the significance of the differences between the two services (mobile or clinic).

Ethics approval

The study was approved by the Health Research Ethics Committee of Stellenbosch University and The International Union against Tuberculosis and Lung Disease Ethics Advisory Group. Permission was obtained from the Cape Town City Health Directorate and the Western Cape Government Department of Health to undertake the research in their facilities.

RESULTS

A total of 1063 participants were enrolled in the study; 511 from mobile HCT services and 552 from clinic HCT services.

Routine data collected during the study period showed that 1049 clients self-initiated HCT at mobile services and 813 at clinic services. The study population is similar to the general population who self-initiated mobile and clinic HCT services in terms of sex (Table 1). Due to a large proportion of missing age variables for those who attended HCT services but did not participate in the study, we are not able to draw a similar comparison in terms of age.

In all 8 areas the proportion of males accessing mobile HCT exceeded that of clinic HCT. In total 261 (51%) were male in mobile compared to 149 (27%) in clinics ($p < 0.001$) (Table 2).

Table 1: A comparison of study participants and non-participants at mobile and clinic HCT services for sex and age

	Mobile HCT		p -value	Clinic HCT		p-value
	Study data: participants n (%)	Routine data: non-participants n (%)		Study data: participants n (%)	Routine data: non-participants n (%)	
Sex	n = 511	n = 538		n = 552	n = 261	
Males	261 (51)	276 (51)	p = 0.942	149 (27)	69 (26)	p = 0.867
Females	250 (49)	262 (49)		403 (73)	192 (74)	
*Age						
18-25 yrs	158 (31)	117 (28)		228 (41)	20 (24)	
26-30 yrs	110 (22)	72 (17)		124 (23)	46 (56)	
31-50 yrs	201 (39)	192 (46)		179 (32)	12 (15)	
>50 yrs	42 (08)	38 (09)		21 (04)	4 (05)	
Missing	0	119		0	179	

*Age proportions are calculated on recorded values only.

The mean age of participants attending mobile HCT was higher than clinic participants (Table 2). The proportion of clients, 31 to 50 years and older than 50 years, were significantly more likely to access mobile than clinic services. Neither the marital status ($p = 0.256$) nor educational attainment ($p = 0.769$) of participants who accessed mobile HCT differed significantly from those who accessed clinic HCT (Table 2). Of the total study population, 31% had completed schooling and a further 9% had tertiary education.

No significant difference was found for socio-economic variables between participants who accessed mobile and clinic services (Table 3) with the exception of access to own piped water, defined as piped water in their house or yard. Participants who accessed mobile HCT reported significantly less access to their own piped water ($p = 0.029$). In both groups, the majority were unemployed, lived in informal housing, and had access to electricity for cooking.

The reasons for selecting the service provider differed (Table 4). Participants who accessed mobile HCT services were significantly more likely to be passing by and took advantage of the opportunity to test ($p = 0.014$). Participants who accessed clinic HCT services were significantly more likely to access the clinic because it was in close proximity to home or work ($p = 0.035$). Perceptions of short queues and quick service did not influence the choice of service provider.

Table 2: A comparison of demographic variables of participants at mobile and clinic HCT services

	Mobile n (%)	Clinic n (%)	Effect size* % (95% CI)	p value
Gender	n = 511	n = 552		
Males	261 (51)	149 (27)	23.7 (12.1 to 35.3)	$p < 0.001$
Females	250 (49)	403 (73)		
Age	n = 511	n = 552		
Mean age	33 (sd = 11.29)	30 (sd = 9.49)	Years 2.8 (0.9 to 4.8)	$p = 0.023$
18-25 yrs	158 (31)	228 (41)		$p < 0.001$
26-30 yrs	110 (22)	124 (23)		$p = 0.712$
31-50 yrs	201 (39)	179 (32)		$p = 0.019$
>50 yrs	42 (08)	21 (04)		$p = 0.002$
Marital status	n = 508	n = 552		
Married	135 (27)	179 (32)	6.0 (-3.0 to 16.0)	$p = 0.256$
Single	373 (73)	373 (68)		
Education	n = 510	n = 549		
Incomplete or no	305 (60)	331 (60)	1.0 (-9.0 to 12.0)	$p = 0.769$
Completed schooling	205 (40)	218 (40)		

*Effect size estimated for the first category of variable.

No significant difference regarding travel time or travel cost was found between participants accessing either service (Table 5). The majority of participants (91%) spent less than 30 minutes travelling to the service. Overall 88% incurred no out of pocket travel cost in accessing the service. The majority of those who incurred a cost paid less than US\$ 2 (exchange rate US\$ 1: ZAR 10).

Table 3: A comparison of socio-economic variable at mobile and clinic HCT services

	Mobile n (%)	Clinic n (%)	Effect size* % (95% CI)	p value
Employment status	n = 509	n = 550		
Formal	111 (22)	150 (27)	-5.7 (-3.2 to 14.6)	p = 0.172
Informal/unemployed	398 (78)	400 (73)		
Social grant	n = 506	n = 551		
No social grant	432 (85)	444 (81)	-5.0 (-10.0 to 9.0)	p = 0.453
Social grant	74 (15)	107 (19)		
Housing type	n = 510	n = 550		
Brick	244 (48)	276 (50)	-4.0 (-20.0 to 14.0)	p = 0.640
Informal	266 (52)	274 (50)		
Drinking water	n = 511	n = 547		
Own piped water	393 (77)	458 (84)	7.0 (-2.0 to 11.0)	p = 0.029
Public piped water	118 (23)	89 (16)		
Fuel for cooking	n = 511	n = 551		
Electricity	480 (94)	496 (90)	-4.0 (-8.0 to 1.0)	p = 0.072
Other fuel source	31 (6)	55 (10)		

*Effect size estimated for the first category of variable.

Waiting times were significantly shorter for clients accessing mobile services ($p = 0.030$). The maximum waiting time at mobile HCT services was 30 minutes and at clinic HCT services was 60 minutes. Although total time taken to go through counselling and testing was significantly shorter for clients accessing mobile services ($p \leq 0.001$), the majority of clients, irrespective of where they accessed HCT services, took less than 30 minutes.

Table 4: A comparison of reasons for selecting a service provider

		Mobile n (%) n = 510	Clinic n (%) n = 548	Effect size* % (95% CI)	p value
Passing by (opportunistic)	yes	246 (48)	6 (1)	47.0 (27.0 to 67.0)	p = 0.014
Passing by (opportunistic)	no	264 (52)	542 (99)		
Close to home/work	yes	213 (42)	399 (73)	-31.0 (-51.0 to 31.0)	p = 0.035
Close to home/work	no	297 (58)	149 (27)		
Short queues	yes	69 (14)	13 (2)	10.8 (-12.1 to 33.7)	p = 0.353
Short queues	no	441 (86)	535 (98)		
Quick service	yes	109 (21)	64 (12)	0.9 (-10.0 to 29.0)	p = 0.358
Quick service	no	401 (79)	484 (88)		

*Effect size estimated for the first category of variable.

Table 5: A comparison of travel and waiting times of participants at mobile and clinic HCT services

	Mobile n (%)	Clinic n (%)	Effect size* % (95% CI)	p value
Travel time	n = 506	n = 550		
≤30 min	462 (91)	505 (92)	0 (-8.0 to 8.0)	p = 0.872
>30 min	44 (9)	45 (8)		
Travel cost	n = 434	n = 462		
No cost	397 (91)	395 (85)	-2.0 (-5.0 to 1.0)	p = 0.119
Cost incurred	37 (9)	67 (15)		
Waiting time	n = 509	n = 552		
<15 min	422 (83)	214 (39)	43.0 (15.0 to 69.0)	p = 0.030
≥15 min	87 (17)	337 (61)		
Total time	n = 510	n = 552		
<30 min	447 (88)	408 (74)	14.0 (9.0 to 30.0)	p ≤ 0.001
≥30 min	63 (12)	144 (26)		

*Effect size estimated for the first category of variable.

DISCUSSION

HIV risk is influenced by a variety of factors, including sex, age, educational status, marital status and poverty. HIV prevention and care is dependent on HCT services being accessible to those at risk.

In Cape Town, HCT services have been provided at clinics and through mobile services. The majority of those tested at clinics receive a provider-initiated service, based on clinical indications. Clinics also provide a range of services not provided by mobile HCT and therefore have the ability to attract a large proportion of clients. However, their HCT coverage is limited to populations groups who access clinics. All clients who access mobile

services self-initiate. Routine data (2013) from the City of Cape Town clinics shows that 28% of clients self-initiate.

Studies conducted in Cape Town have demonstrated that mobile HCT is a way to target other groups and is able to target more males and across age groups [20,25,26] than other HCT strategies. These studies have included provider-initiated HCT within clinics. This study is different as it includes self-initiated clients at both services and the study population were thus more comparable.

This study showed that significantly more males were counselled and tested through mobile HCT compared to clinic HCT within the study as a whole and within each of the matched pairs. This finding confirms the results of other studies conducted within the Cape Town district [25,27] and a study conducted in a rural area of another South African province [18]. It highlights the ability of mobile HCT to increase access to HCT for males, who traditionally do not access HCT at clinics. Flexibility of services allows mobile HCT to be provided at places where males typically congregate, like transport hubs (train stations and taxi ranks).

Overall, participants accessing mobile HCT were 3 years older than those accessing clinic HCT. Participants accessing mobile HCT were significantly more likely to be from the older age categories of 31-50 years and >50 years, while those accessing clinic HCT were significantly more likely to be in the 18-25 year age category. Younger people may access HCT at a clinic facility during visits for family planning or when taking their children for immunizations, making it easy to request an HIV test at the same time. Since this study was concluded, family planning services have been incorporated into Community-based HCT and we have seen a large increase in the number of young women accessing services. We have also considered that mobile HCT may not appeal to the youth and making the service more youth friendly may be a worthwhile opportunity. Earlier studies have shown that mobile HCT services can access both older age groups, [25] and youth [18,28]. More research is needed.

HIV prevalence in South Africa is much higher among young women compared to young men. Overall in age groups 15-19 years and 20-24 years, significantly more females are HIV-infected than their same age male peers [1,29]. HIV prevalence disparities by gender and age may be an indication of intergenerational sex [30]. HCT

strategies that access older men and younger women play an important role in HIV prevention and care.

Overall, the socio-economic status of the two populations were similar, both were vulnerable in terms of education, levels of poverty and unemployment. Data from the South African Census (2011) for these communities showed that the majority of people had not completed school, were unemployed, lived in formal dwellings and used electricity for cooking [31] and were comparable to the study population.

Participants accessing either mobile or clinic HCT services were potentially living within these same impoverished areas. The only significant difference found in the study between the two populations was that clients who attended mobile HCT were significantly less likely to have access to their own piped drinking water.

Overall, the majority of participants were not formally employed. People not engaged in formal work are more likely to be in the community during the day. Mobile services have the opportunity to reach these people. The most common reason for working people not accessing HCT is not being able to leave work [22,28]. This provides an opportunity for mobile services to access work places directly. Being able to take services to a targeted population, thereby making the services accessible is a benefit of mobile services.

Mobile HCT was able to access a significantly higher proportion of participants, who were just passing by the service and were able to take advantage of the opportunity presented to them. We refer to these as opportunistic visits, as clients would otherwise not have accessed HCT at that time. This finding underlines the importance of taking the services to the people, in that people will utilize an opportunity to test and are willing to test if services are easily accessible. A significantly higher proportion of participants who accessed clinic HCT reported that the clinic was close to their home or work. This again highlights the importance of proximity in access. A study in Uganda showed the strongest predictors of satisfaction with services included accessibility, convenience and availability of services [32].

A significantly higher proportion of participants who accessed mobile HCT reported shorter waiting times before seeing a counselor. As longer waiting times are associated with higher levels of dissatisfaction with services [33], waiting time should be a consideration for clients who only want to access HCT. The majority of participants did not incur any travel

costs and reported a travel time of less than thirty minutes. Costs in terms of time and money associated with accessing services as well as longer travelling distances and waiting times have been shown to have a negative association with use of services [34]. The ability of mobile services to reduce travel time and costs due to the high proportion of opportunistic visits, together with short waiting times, contributes to making HCT easily accessible and affordable.

The study had limitations. The communities were not randomly selected, but based on the sites in which mobile services were being implemented. The study was conducted within a limited geographical urban/peri-urban area. Any generalizability of results should be made with caution. Additional research needs to be carried out, including in rural and semi-rural areas.

We were unable to record HCT clients who were not referred to us or who refused participation, but the routine data collected for the same time period has been used and the uptake of participants is known and these were representative in terms of gender. We cannot be certain about the representativeness of the age data due to missing variables.

A major strength of the study is that the findings have provided detailed demographic and socio-economic data on the participants who self-initiated at mobile and clinic HCT services. This has allowed us to gain some insight into the characteristics of these populations and their potential risk for HIV based on their characteristics and impoverished circumstances.

The study has highlighted the strengths of mobile HCT services with the ability to target populations directly and thereby provide access to those who would not typically access services e.g. males and opportunistic clients. Short travelling times, little travel costs and short waiting times also make mobile services easily accessible. The study also identified that proportionately fewer youth attended mobile services and this provides the opportunity to deliver more youth friendly services.

Future research should determine the drivers and barriers to HCT at either mobile or clinic services through community surveys to assess those who have never tested previously and may be at high risk.

CONCLUSIONS

Mobile services can access at risk populations, have the ability to increase access to males and those who are just passing and would otherwise not have accessed HCT at that time. Mobile HCT services provide the opportunity to target specific populations e.g. at workplaces, at transport hubs and within communities. The flexibility of mobile services can also allow access to populations that are currently being missed. Strategically, mobile HCT services should run in conjunction with clinic HCT services to reach all age groups and both sexes. If universal access to HCT is to be obtained, then mobile HCT services should be considered in the overall HCT strategy.

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CHAPTER 3: AVAILABILITY AND ACCEPTABILITY OF HIV COUNSELLING AND TESTING SERVICES. A QUALITATIVE STUDY COMPARING CLIENTS' EXPERIENCES OF ACCESSING HIV TESTING AT PUBLIC SECTOR PRIMARY HEALTH CARE FACILITIES OR NON-GOVERNMENTAL MOBILE SERVICES IN CAPE TOWN, SOUTH AFRICA

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My contribution to this study: I am first author on this manuscript. I conceived and designed the study. I employed and trained the research assistants and managed the overall process of data collection.

I led the analysis and interpretation of the data. I wrote the initial manuscript, made revisions as per co-author suggestions and submitted the manuscript for publication. N. Leon assisted with the analysis and interpretation. P. Naidoo assisted with the design of the study. N. Beyers supervised me throughout the process. All co-authors read, gave comment and approved the final manuscript.

Abstract

Background: The South African government is striving for universal access to HIV counselling and testing (HCT), a fundamental component of HIV care and prevention. In the Cape Town district, Western Cape Province of South Africa, HCT is provided free of charge at publically funded primary health care (PHC) facilities and through non-governmental organizations (NGOs). This study investigated the availability and accessibility of HCT services; comparing health seeking behaviour and client experiences of HCT across public PHC facilities (fixed sites) and NGO mobile services.

Methods: This qualitative study used semi-structured interviews. Systematic sampling was used to select 16 participants who accessed HCT in either a PHC facility (8) or a NGO mobile service (8). Interviews, conducted between March and June 2011, were digitally recorded, transcribed and where required, translated into English. Constant comparative and thematic analysis was used to identify common and divergent responses and themes in relation to the key questions (reasons for testing, choice of service provider and experience of HCT).

Results: The sample consisted of 12 females and 4 males with an age range of 19–60 years (median age 28 years). Motivations for accessing health facilities and NGO services were similar; opportunity to test, being affected by HIV and a perceived personal risk for contracting HIV. Participants chose a particular service provider based on accessibility, familiarity with and acceptability of that service. Experiences of both services were largely positive, though instances of poor staff attitude and long waiting times were reported at PHC facilities. Those attending NGO services reported shorter waiting times and overall positive testing experiences. Concerns about lack of adequate privacy and associated stigma were expressed about both services.

Conclusions: Realised access to HCT is dependent on availability and acceptability of HCT services. Those who utilised either a NGO mobile service or a public PHC facility perceived both service types as available and acceptable. Mobile NGO services provided an accessible opportunity for those who would otherwise not have tested at that time. Policy makers should consider the perceptions and experiences of those accessing HCT services when increasing access to HCT.

BACKGROUND

In South Africa, 12% of the population (6.4 million) are living with HIV [1]. The AIDS epidemic is generalised with primarily heterosexual transmission [2]. Overall HIV prevalence is highest among females (14%) compared to males (10%) and among urban informal dwellers (20%) compared to those living in rural informal areas (13%) [1]. More than half (56%) of the burden lies within the poorest 40% of the population [3]. Around Cape Town the antenatal prevalence ranges between 9% and 37% across health sub-districts [4]. Access to HIV services needs to be in line with demographic and socioeconomic factors.

HIV counselling and testing (HCT) is a fundamental component of HIV care and prevention. In 2012, 65% of South Africans reported to have ever tested for HIV of which 66% tested in the previous 12 months [1]. Although indicative of fairly good testing coverage, it falls short of the Government's call for all to test annually [5] and many individuals, including those most likely to be living with HIV, still do not know their HIV status [6]. Public health facilities cannot test everyone as some populations for example males do not readily access public health facilities [7]. In striving toward universal access to HCT, a better understanding of the factors that enable and constrain access to HCT is important and diverse testing opportunities should be considered in an attempt to increase access to HCT.

"Access" is an important concept in health services research [8]. However, it is a multidimensional and complex term [9] that has not been precisely defined [10] nor measured in a consistent manner [9]. Although it is widely accepted that access to health services, refers to the opportunity to use a health service [3], utilization of health services is only one indicator of access having been realized [11] and is insufficient on its own to determine access. A broader interpretation includes utilization of a health service being dependent on three dimensions of access that are conceptually clear and separate [12]; availability, acceptability and affordability [13,14]. Within this framework, availability is concerned with health services being supplied in the right place and time to meet the needs of the population [12], acceptability is concerned with the provider and patient attitudes and expectations of each other and affordability measures the relationship between the cost to the patient to use the service and their ability to pay [14].

This study focuses on the dimensions of availability and acceptability and investigated reasons why clients choose to have an HIV test, why they chose either a public funded primary health care facility or a non-governmental mobile facility as service provider and compared their experiences of HCT. As HCT is offered free of charge at both service providers, affordability was excluded from this study. This study therefore compares participants who accessed either one of two HCT service types.

METHODS

Setting

In the Cape Town district of the Western Cape Province of South Africa, HCT is routinely provided at publically funded primary health care facilities, district hospitals, at secondary and tertiary level care. There are approximately 142 public primary health care (PHC) facilities offering free HCT services. HCT services are also provided free of charge through non-governmental organizations (NGO).

Since 2008, the Desmond Tutu TB Center (DTTC) at Stellenbosch University has worked in partnership with non-governmental organizations to establish Community HCT centers in 8 communities around the Cape Town metropole in the Western Cape Province of South Africa. These services are provided either from community-based centers or on a mobile basis, whereby non-permanent structures are set up in appropriate spaces within communities to specifically target groups that do not typically access facility-based services [15]. Stellenbosch University provides overall management, technical assistance and quality assurance and contracts local NGOs to provide HCT services from either the community HCT centers or on an outreach, mobile basis. Mobile services are provided from pop-up tents and a caravan (mobile van) set up in an appropriate open space, including public transport hubs such as taxi ranks, train stations or open fields.

This study was embedded within a larger study, which compared the characteristics of clients who accessed HIV testing across public PHC facilities and NGO mobile services [16]. This larger study took place in the above-mentioned eight communities on the outskirts of the city of Cape Town. These communities are under-developed, densely populated, have a mixture of formal and informal dwellings and are characterised by high unemployment, socio-economic challenges and a high HIV and TB burden.

The larger study mapped a geographical area within each of these 8 communities, by plotting a 2 km radius around each of eight pre-existing NGO community-based HCT centers. All public PHC facilities that fell within this 2 km radius were included in the study. In each of the 8 areas, between one and four public PHC facilities fell within this 2 km radius. There was no overlap between areas. The study focused on comparing the HCT services of mobile funded NGO providers and public PHC facilities within these areas. Services were comparable in terms of operating hours and neither provider type charged a fee.

Design and sampling

This is a descriptive qualitative study. For the purposes of this study, two of the eight geographical areas were purposively sampled to ensure the inclusion of an ethnically diverse set of respondents. In area one, 1 NGO mobile service and two public PHC facilities were included and in area two, 1 NGO mobile service and 4 public PHC facilities were included.

This study was designed to specifically compare issues around availability and acceptability of HCT services at two existing HCT service types, as reported by those who accessed HCT. Therefore, sampling included only those who accessed HCT at either of these two service types.

A total of sixteen adult participants (>18 years) were enrolled in the study. Lists containing the participant's barcoded study identity number from the larger study were used to systematically sample every tenth participant from those who had attended the mobile services and each PHC facility within the selected areas until 8 participants were enrolled from each service type. In area one, 4 participants were sampled from the mobile and two from each of the two PHC facilities. In area two, 4 participants were sampled from the mobile and one from each of the four PHC facilities. Including participants from different facilities allowed for client experience across several health facilities to be explored.

Each sampled individual was contacted telephonically and a date set for the interview. If the individual was not able to be contacted or declined to be interviewed, the next individual on the list was contacted until for each area, the required number of participants gave permission to be interviewed. In order to obtain permission from 8

participants who had attended the NGO mobile services, 24 were sampled from the lists of which 15 were not contactable (no answer, had moved or had missing contact details) and 1 declined. In order to obtain permission from 8 participants who had attended the public PHC facilities, 19 were sampled: 10 were not contactable and 1 declined.

Data collection

Semi-structured interviews were conducted between March and June 2011, approximately 1 month after the participants' HIV testing experience. One male and two female interviewers, with experience in qualitative interviewing and from similar ethnic groups to the participants did the interviews in the preferred language of the participant (Afrikaans, isiXhosa or English). To minimise potential bias during data collection the interviewers were not part of the larger initial study and were not aware of the participants' HIV status.

All interviewers were trained on the overall objective of the study and in using the interview guide as a tool. This guide comprised 3 global topics; participant demographics, health seeking behaviour and HCT experience. The semi-structured interview tool was developed in English and was not translated into any other language. The interviewers could speak and understand English well. The training they received allowed them to translate any questions if required as they conducted the interviews. Interviews were conducted in the communities, predominantly in participants' homes or a private space elsewhere, including in the interviewer's car. The decision regarding where to hold the interview was a mutual one between interviewer and participant based on safety and privacy. Interviews varied between twenty and sixty minutes, were digitally recorded and transcribed by each interviewer. Interviews conducted in a language other than English were translated during transcription.

Analysis

Each interview transcription was read and reread by SM, to ensure familiarity with the content. A constant comparative analysis was done to identify common and divergent responses in relation to the key questions and categorized and abstracted to form common themes. A sample of four transcripts (two from PHC facilities and two from mobile services) were independently analyzed by a co-author (NL). There were no

discrepancies in the analysis between the two researchers. Those involved in data analysis were blinded to participant HIV status.

Two identical matrixes, one each for NGO mobile and public PHC facilities, were developed in Microsoft Excel 2010. These were used to categorize and compare data across provider types. Health seeking behaviour and HCT experience were entered as predetermined global themes in the first column. The main interview questions related to each of these global themes. Participant responses to these global themes were organized around sub-categories, which were entered underneath the relevant global theme. These sub-categories were aspects of the global themes that the researchers were interested in and formed minor questions (prompts) on the interview schedule, meaning that they were only used if the participant provided insufficient detail when responding to the main interview questions. Within each of these sub-categories, responses were compared across participants and themes emerged within each sub-category. The matrix is illustrated in Table 1. A general comments column was included to note consistent and divergent responses across HCT provider types.

Table 1: Illustration of the data analysis matrix

Global Theme: Health seeking behaviour				
Sub-category	Emergent themes	Participant 1 barcode	Participant 2 barcode	Participant 3 barcode
Reason for testing	Opportunity	"...on the way we saw the tents on the side of the road with a sign that says HCT"		
	Affected by HIV	"I have a sister in XXX who is HIV positive..."		"have a cousin who is HIV positive...she died in January."
	Perceived personal risk for HIV		"...I had a boyfriend whom I did not trust, and then I thought for my sake I needed to know my status"	" My boyfriend doesn't want to use a condom..."

Ethics approval

The study was approved by the Health Research Ethics Committee of Stellenbosch University (N10/09/288) and The International Union against Tuberculosis and Lung Disease Ethics Advisory Group (EAG 58/10). All participants were part of the larger study and had already provided written consent, which included the possibility of being contacted for face to face interviews. When contacted telephonically, participants could decline to be interviewed and those interviewed were free to end the interview at any point. Participants were not given any incentives for taking part.

RESULTS

All participants had accessed HIV counselling and testing at least once at either a public primary health care facility or a non-governmental mobile service between February and April 2011.

Demographics

The demographic characteristics of the participants who attended mobile and clinic HCT were similar (Table 2). Twelve females and 4 males with an age range of 19-60 years (median age 28 years) were interviewed; 8 each per HCT provider type. Males were under represented in both groups, with 3 of the 4 male participants having accessed mobile HCT. All participants could speak and understand English, but most preferred to answer the questions in their first language, in order to better express themselves. Overall, 10 participants were black and spoke isiXhosa, while 6 were mixed race, of which 5 spoke Afrikaans and 1 spoke English during the interviews. Eleven participants reported that they had never been married and most participants had at least one child. Half had completed grade 12 schooling and 10 were not employed. Half of the participants reported to live in an informal structure (wood or tin shack).

Health seeking behaviour

Participants, irrespective of which service provider they visited, reported similar reasons for having an HIV test; availability of HCT, being affected by HIV and a perceived personal risk for HIV. They also reported similar reasons for choosing a particular service provider; accessibility, familiarity and acceptability of services. No differences in experiences or perspectives by age, sex or ethnicity were noted.

Reason for seeking an HIV test

Opportunity

Participants who utilised mobile HCT reported that the opportunity to test presented itself because they walked past the pop-up tent offering the HCT service and would otherwise not have tested at that particular time: “On the way we saw the tents on the side of the road with a sign that says HCT.” (Female, 19 years). Opportunity was also created when staff actively mobilised community members to test: “I was busy in my garden... they asked if I would like to come for a TB test...when I got to the tent they told me about the HCT service and offered it to me.” (Male, 60 years). Opportunity to test was also realised when individuals accompanied a friend or family member who had come for an HIV test: “I accompanied my sister...she didn’t want to go alone” (Female, 38 years). In the PHC facilities, HCT was also made available through the opportunity to test when someone visited the facility for another health reason. This was highlighted where HIV testing can be provided as part of an integrated clinical service, as one participant explained: “I got tested when I went for my [family planning] injection.” (Female 37 years).

Affected by HIV

Being personally affected by HIV through knowing someone who has HIV or who died of a related illness emerged as a common theme. Participants from both the public PHC facilities and NGO mobile services explained how they were either directly motivated by family and friends, to test for HIV: “I have a friend who is HIV, she would tell me to go and test...” (Female, 25 years) or indirectly, through illness of those close to them: “At home there is someone who is infected, so I just wanted to know mine [HIV status].” (Female 19 years). Loss of friends and family, through death was described as providing a strong motivation to seek out HIV testing: “I have a cousin who is HIV positive...she died in January...that was one of the things that motivated me a lot” (Female 21 years).

Table 2: Demographic data of participants interviewed across mobile and clinic

	HCT		
	Mobile HCT (n = 8)	Clinic HCT (n = 8)	Total (n = 16)
Ethnicity and Sex			
black males	2	0	2
mixed race males	1	1	2
black females	3	5	8
mixed race females	2	2	4
Age groups			
18-25 yrs	5	1	6
26-30 yrs	1	2	3
31-50 yrs	2	4	6
> 51 yrs	1	0	1
Marital status			
married	2	3	5
not married	7	4	11
Education			
completed grade 12	6	2	8
incomplete schooling	3	5	8
Employment			
unemployed	5	5	10
employed/other	0	1	1
Dwelling			
formal (brick)	5	3	8
informal (shack)	4	4	8

Perceived personal risk for HIV

Participants, irrespective of which service provider they utilized, were motivated to seek an HIV test if they believed that they were at risk, either because they believed their partner had been unfaithful and or because they had practised unsafe sex. Some female participants reported that they distrusted their partner, as one participant explained: “At the time I tested, I had a boyfriend whom I did not trust, and then I thought for my sake I needed to know my status.” (Female, 22 years). Another explained how suspicion of infidelity, combined with practicing unsafe sex was the motivating factor: “My boyfriend doesn’t want to use a condom...I also saw him with another woman...I was in fear not knowing how long it has been going on.” (Female, 17 years). In some cases, the presence of multiple partners was the motivator: “I found out he was having an affair and decided to go for a test.” (Female, 25 years). One male participant reported that his multiple partnerships motivated him to test for HIV: “I have these

girls...sometimes I don't use condoms." (Male, 22 years). One female indicated that recurring sexually transmitted infections motivated her to test: "I went for a test after I kept getting [sexually transmitted] infections." (Female, 39 years).

Not everyone reported an underlying reason for having a test. Some reported that they wanted to know their HIV status. A participant explained: "I was just curious to know my status." (Female, 30 years).

Reason for choice of service provider

Accessibility

Participants highlighted accessibility of the service provider as a factor when choosing either a NGO mobile or public PHC facility. They reported that both service providers were accessible because they were within walking distance and mostly involved no transport costs. For NGO mobile services, access was often on the spur of the moment. A taxi driver used the mobile HCT service during a break in his work schedule: "I was parked at the taxi terminus waiting for my taxi to fill up. I could just walk over to them [the tents]), it was very convenient to me." (Male, 38 years). Two participants who utilised public PHC facilities reported that HCT was accessible because it was offered as part of other health services: "[HIV] testing is provided automatically with family planning." (Female, 36 years).

Familiarity and acceptability

Previous experience and satisfaction with the service received also played a role in the choice of provider. Respondents who utilised NGO mobile services reported: "I always go to the tents...people say you wait very long at the clinic." (Female, 38 years). Participants who utilised public PHC facilities reported: "I knew the [HCT] service was rendered there [at the facility]." (Female, 32 years). One participant indicated that lack of familiarity with tents dissuaded her from accessing them: "I don't know these other places like these tents..." (Female, 21 years). For another participant, the specialised and targeted service provided by the NGO mobile services had advantages. He explained: "Tents are different from clinics...in clinics you must wait with sick people." (Male, 22 years).

Experiences of HCT

Participants reported predominantly positive experiences irrespective of where they accessed HCT, though there were some complaints about HCT services within public health facilities. Concerns about stigma were re-ported for both services. The shorter waiting times at NGO mobile services distinguished it from the public PHC facilities.

Waiting time

The short waiting time at mobile HCT was highlighted as a major positive factor: “I sat outside for 2 min and then they called me in.” (Female, 22 years). Three participants with experience of attending public PHC facilities and NGO mobile services compared the waiting time at the mobile service to the longer waiting times experienced at the public facility: one of them said: “The clinic has long queues and you wait forever...at the tents there are no queues.” (Female, 24 years).

Long waiting times was a common experience for those participants who accessed HCT services at public PHC facilities. One participant said: “You wait first...I waited about 2 h.” (Female, 30 years). By contrast, one participant reported no waiting time when accessing HCT at a public PHC facility: “I just went in.” (Male, 23 years).

Staff attitude, competence and trust

Staff attitude, competence and perceived trustworthiness emerged as factors influencing the HCT experience. The friendliness of staff made a particular impression on participants. Several made explicit reference to this, especially at the NGO mobile sites: “People are nice and friendly...I was welcomed with a big smile.” (Female, 19 years). A few participants compared their experience of staff at the mobile service as being more favorable than at the public facilities: “People are friendlier...unlike in the clinic...staff at the clinic are tired and don’t feel like talking to you.” (Female, 22 years). Participants who attended public PHC facilities, more often reported a mixed picture: “Clinic staff are friendly, but there are a few nurses that are rude.” (Female, 30 year).

Overall participants reported positive perceptions around staff proficiency. Respondents who visited the NGO mobile service were generally positive: “Counsellors are good. They know how to tell people their results” (Male, 38 years) and “I felt the nurse pressing against me [when doing the finger prick] and she said she was finished; it was not painful.” (Female, 27 years). Similarly, participants who attended a public PHC facility reported

being pleased with the level of competence: “The [nursing] sister explained what she was going to do.” (Female, 39 years).

All participants reported a level of trust in the staff, irrespective of where they accessed HCT. A respondent who visited the NGO mobile service reported: “I trusted them with my information.” (Female, 24 years) and one who attended a public PHC facility said: “I sat privately... everything was very confidential... I felt I could trust them.” (Female, 39 years).”

HCT setting

Participants described the setting in terms of cleanliness, privacy and perceived stigma. Cleanliness of the surroundings in both the public PHC facilities and NGO mobile services contributed to a sense of confidence in the services. Two participants were particularly impressed by the NGO mobile service, commenting that: “The place was neat and clean, it looked like a real health facility.” (Male, 60 years).

Participants experienced the NGO mobile service as private: “there was privacy and no one will listen to what you are saying” (Female, 27 years). Participants had differing views on privacy within the public PHC facilities, with some noting it lacked privacy, whilst others found it offered sufficient privacy. Privacy in the consultation room was sometimes affected by other staff or patients entering the room or because entering or exiting the counselling room indicated that you were there for an HIV test. One participant summed up a common sentiment: “while in the [counselling] room, people just knock and come in, so I feel the tents are more private and confidential.” (Female, 22 years). In contrast, another participant who had also attended a public PHC facility had a more private experience of HIV testing: “Everything was private...no one will even knock on the door.” (Female, 39 years).

Participants commented on stigma being a concern at both public PHC facilities and NGO mobile services. One participant was concerned about stigma at the health facility and compared the mobile service more favorably: “At the clinic most people know you, the minute you enter the room they know what you are there for and decide that you are HIV positive....There is no discrimination [at the tents]...all my worries about getting tested were put at ease.” (Female, 22 years). Another participant expressed the opposite sentiment: “At the clinic at least I am ok because there is a lot happening

there, but at this one [tents] they know straight away there is nothing else but [HIV] testing here.” (Female, 21 years).

DISCUSSION

This study compared client health seeking behaviour and experiences at two types of HCT services; those provided by non-governmental organizations that provided mobile services and public primary health care facilities, offering HCT services from fixed sites.

Irrespective of where participants obtained their HIV test, health seeking behaviour was related to the opportunity to test, being affected by HIV and a perceived personal risk for HIV. These findings are consistent with other studies in sub-Saharan Africa which showed that having an HIV test was associated with knowing the location of a test site [17, 18], personally knowing someone with HIV [17, 19, 20], and a perceived sense of being at risk for HIV infection [17, 18, 21, 22].

The concept of availability is concerned with an adequate supply of services [9] and the opportunity to obtain an HCT service by those who need it when they need it [23]. This study has highlighted that opportunity to obtain an HIV test does play a role in the utilization of HCT services. Providing an HCT opportunity, whether through a mobile service provided at a busy transport hub or an integrated health service at a public health facility, makes HCT physically available. Mobile services appear to have ‘opportunistic’ clients compared to health facilities, as they are able to attract those who are just walking past and who would otherwise not have tested for HIV at that particular time. Mobile HCT plays a role in increasing access for those who were not contemplating testing until this opportunity arose.

Opportunity to test is closely aligned with accessibility, which emerged as an important consideration for participants regardless of which service they attended. Participants who attended the NGO mobile services spoke about “just passing by”. The accessibility of mobile services may lie in the increased proximity of the testing site to the surrounding community; reducing travel time and cost for those who do not stay close to a clinic. This is in line with studies in sub-Saharan Africa which have shown that distance to testing site and travel cost are barriers to HIV testing [19, 24, 25]. Those who attended public PHC facilities reported that the facility was in close proximity to where they live. Health facilities are able to provide HIV testing through integrated health care, for

example reproductive health services, making HIV testing very accessible to those who attend these services. For these clients, there is no additional travel time or cost to acquire an HIV test.

The convenience of having physical access to the opportunity to test for HIV played a role in participants' decisions to test for HIV. The accessible opportunity that mobile HCT offers should be considered when aiming to increase access to HCT overall, as mobile HCT can provide services to those who are passing by and would not have accessed an HIV test at that particular time. Currently, mobile services are limited in the number of related health services they offer compared to public primary health care facilities. Future research could determine if a wider variety of health services at mobile HCT could attract a higher number of people.

Improving availability of an HCT service requires consideration around the manner in which the service is organized to meet the needs of the client. Within this study, waiting time emerged as a differentiating factor between the two service types. Longer waiting times were consistently reported as a source of dissatisfaction in health facilities and may be potential barriers to access. Many South African studies have reported client dissatisfaction with long waiting times with other health services [26–29]. Shorter waiting time encouraged the use of NGO mobile services and may therefore provide an avenue to reduce the time at HCT and thereby expand uptake. However, a higher utilization of mobile services may put a strain on waiting times. It is also important to consider that shorter waiting times is not a unique feature of the NGO mobile service and could also be achieved within a public clinic setting by fast-tracking clients who only want to access HCT services.

Availability is just one dimension of access. Understanding client experiences is also important for developing strategies to strengthen health systems and improve access to services. Acceptability indicates a match between service provision and the expectation of the user [23]. Although acceptability is critical to ensuring that an individual uses a service [14], it is a subjective concept, heavily dependent on the user's expectations. Although this study did not explicitly measure satisfaction, the reported experiences indicate levels of satisfaction, which determine future utilization of health care services and are ultimately linked to access [27].

Participants reported overall positive experiences irrespective of where they accessed services. Staff attitude, competence and trust emerged as factors influencing acceptability. Participants who accessed mobile services experienced friendly competent staff that they felt they could trust with keeping their HIV results confidential. Reports regarding the friendliness of health facility staff were contradictory and instances of poor staff demeanor were noted. While some South African studies reveal high levels of satisfaction with public health care providers [26, 30], others have reported that staff did not treat patients with sufficient respect [27, 31]. Anticipated disrespectful treatment has been shown to be partly accountable for delayed care seeking [13]. Conduct of nurses is a core element by which clients judge health services [32]. Although this study did not identify reasons for poor staff demeanor, shortage of staff and management, inadequate resources, high workloads and stress and burnout have been identified as major challenges faced by nurses [33, 34] and may have played a role in the cases where participants reported incidents of poor staff demeanor.

Healthier working environments, with adequate resources and reduced stress have been linked to positive client experiences [35]. Interventions that strengthen management capacity [36], ensure teamwork among healthcare providers [37] and enhance trust between health care providers and patients [38] are required for a healthier working environment. Within the NGO mobile HCT services, professional nurses are employed in a management capacity and receive continual training in performance management skills. This includes developing skills in data evaluation, which allows the professional nurses to better understand their HCT data, identify gaps in the services and generate and implement plans that address these gaps. In this manner professional nurses are able to provide strategic direction to their teams. General staff wellness is addressed through regular debriefing sessions. These sessions are hosted bi-monthly by psychologists and social workers and are attended by the entire mobile HCT team. The sessions provide psychosocial support and in addition aim to develop communication and teamwork. These interventions may have played a role in the friendly and competent service reported by participants who accessed mobile HCT.

Participants did not have concerns about the cleanliness of the HCT setting, but were concerned about the risk of being stigmatized in both the health facility and mobile settings. This aligns with previous work in high HIV prevalence settings that showed

that concerns about stigma did not differ between HCT services in integrated or non-integrated health facility settings [39]. In health facilities, perceived stigma was associated with overcrowding and lack of private spaces, whilst at the mobile service; it was due to the public placement of the tents. Further investigation into the experience of stigma and ways to reduce stigma is required to help inform health authorities on ways to limit real or perceived stigma associated with HCT.

This study compared two HCT service providers across two dimensions of access; availability and acceptability. Both dimensions are important considerations when aiming to increase access to HCT services at these health service providers. Future operational research could explore the dimensions of access further within the South African context. Research is required to assess the feasibility of government outreach services, and whether these can increase availability of services, by accessing different populations to those presenting at health facilities. Future studies are also needed to determine the impact of interventions designed to produce a healthy working environment. Randomized control trials could be utilised to determine if such interventions impact on the acceptability of health services within this context. Affordability is a third dimension along which access is measured and should also be taken into consideration in future studies.

Strengths and limitations

The study was conducted within a limited geographical area, which limited the number of PHC facilities and mobile services included. The sample of participants was relatively small. However, the findings align with those in large representative sample surveys [31] and provide significant insight into individual perspectives and circumstances motivating HCT utilization and provider choice.

The translation process was not checked for quality and no back translation was done, which may have limited the quality and depth of the English transcription - some nuances in the language use of patients may not have been sufficiently captured. Not translating the interview guide may have limited the consistency of the translation of questions between interviewers, but all interviewers spoke and understood English well.

The length of the interviews varied, with half of the interviews taking 20 to 30 min, and half 30 to 60 min. This is directly attributed to the amount of probing and may have

limited the depth and quality of the data collected. Whilst all interviews addressed the main guiding questions, depth and quality of data was potentially limited in shorter interviews.

The study only takes into consideration the health seeking behaviour of those who had an HIV test. In order to better understand barriers to accessing HCT, future studies should include participants who have never tested.

The study does provide a unique comparative analysis of NGO mobile services and public sector primary health care facilities providing HCT services within a specific geographical area that is representative of densely populated, low socio-economic urban settings, where the highest levels of HIV infection are found. It also highlights some of the key issues that affect utilization of HCT services from a client perspective in such a setting, which provides insights to guide policy makers and other stakeholders in exploring strategies that can bring us closer to the goal of universal HCT coverage.

CONCLUSION

Realised access to HCT is dependent on a number of factors, some of which have been considered within the dimensions of availability and acceptability of HCT services, as reported by those who utilised either a NGO mobile service or a public PHC facility. Both public sector and mobile NGO HCT services were perceived as available and acceptable for most. The latter provided an accessible opportunity for those who would otherwise not have tested at that time. Policy makers should consider diverse HCT strategies that take into account availability and acceptability of services. In doing so, they should consider the perceptions and experiences of those who have accessed HCT services when increasing access to HCT.

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CHAPTER 4: ACCESS TO HIV TESTING SERVICES IN CAPE TOWN, SOUTH AFRICA: A USER PERSPECTIVE.

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My contribution to this study: I am first author on this manuscript. I conceived of and designed the study. I employed and trained the research assistants and managed the overall process of data collection. I worked closely with the statistician for the analysis and took responsibility for the interpretation of the analysis. I wrote the initial manuscript, made revisions as per all the co-author suggestions and submitted the manuscript for publication. N. Beyers and R. Burger provided supervision; they provided comments on the research design, the analysis and interpretation. L. Rossouw and R. Sloom produced the analysis and assisted with the interpretation of the data. All co-authors assisted with the writing of the paper and gave comment on the manuscript prior to submission for publication.

ABSTRACT

Objective: This study compared availability, affordability and acceptability of two NGO-led HIV testing service (HTS) modalities (mobile and stand-alone) to HTS at a public primary health care facility.

Methods: Adult participants who self-referred for an HIV test were enrolled as they exited HTS modalities. Data collection, using an electronic questionnaire, took place between November 2014 and February 2015. Logistic regression analysis was used to assess differences in participants' demographic characteristics and availability, affordability and acceptability of HTS between modalities.

Results: 130 participants were included in the study. Irrespective of modality, most participants walked to the service provider, had a travel time of less than 30 minutes and reported no costs. Participants at mobile compared to the public facility were less likely to report waiting times ≥ 30 minutes compared to < 15 minutes (aOR < 0.001 , 95%CI $< 0.001-0.03$).

Conclusion: HIV testing services, irrespective of modality, were available and affordable in our study. Waiting times were significantly higher at the public facility compared to the NGO modalities. As South Africa moves toward achieving the first UNAIDS target, it is essential to make HST not only available and affordable, but also to ensure that these services are acceptable, especially to those who have never tested before.

BACKGROUND

South Africa is progressing toward the first UNAIDS target; 90% of people living with HIV know their status by 2020 (1). In 2012, an estimated 65% of the South African population had ever tested for HIV (2). An estimated 23% of HIV positive adults remain undiagnosed (3); the estimated proportion higher among men (31.9%) compared to women (19%) (3). The challenge is to reach those who do not access HIV testing services (HTS) and remain unaware of their HIV-positive status.

In South Africa, the majority of people who tested for HIV in 2012 (70%) utilized public health facilities, with the remaining 30% utilizing private facilities, including those managed by non-governmental organizations (NGOs), and alternative testing modalities (e.g. mobile services) (2).

Published SA studies predominantly describe the demographics of people who utilize different HIV testing modalities, the proportions who were first-time testers and tested HIV positive (4)(5)(6)(7). Limited literature exists around access to HIV testing services (HTS).

“Access” is a complex and multidimensional concept (8). Access to HTS is broader than merely utilization of the service (9); it is dependent on three conceptually different dimensions (10); availability (the extent to which HTS are geographically accessible), affordability (the cost of the HTS in relation to the users’ ability to pay) and acceptability (self-perceived quality of the HTS) (11).

There are a few studies that link utilization to the availability of services (12) and determine availability and acceptability of HTS at public health care facilities (13) and mobile services (14)(15). An improved understanding of access, including availability, affordability and acceptability to public and private (NGO) HTS modalities from the user’s perspective can inform policy and potentially lead to increased numbers of people becoming aware of their HIV-positive status.

The aim of this study was to investigate availability, affordability and acceptability of two NGO-led HIV testing service (HTS) modalities (mobile and stand-alone) to HTS at a public primary health care (PHC) facility.

METHODS

Setting

This study took place in one community within the Cape Metro district, Western Cape Province, South Africa. This purposively selected community is characterized by high unemployment rates, a mixture of formal and informal housing and a high disease burden (16), had a public health facility and an NGO, both providing HTS, existed. The public PHC facility provided a range of services, including HTS and treatment services. HTS was offered as part of clinical care, but individuals could also self-refer for an HIV test (voluntarily decide to learn their HIV status and actively seek out HTS (17)). The NGO offered HTS from two HTS modalities in the same community. A stand-alone center (fixed site) offered HTS from a rented space within a local shopping center. Mobile HTS was provided from pop-up tents and a caravan (mobile van) set up in appropriate open spaces within the community (spaces were selected on an ad hoc basis and changed regularly). The NGO modalities only offered HTS services.

All three modalities followed the same HIV testing algorithm, guidelines and rapid HIV testing kits and utilized trained HIV lay counselors to provide HTS free of charge and operated during standard business hours.

Design

A cross-sectional survey compared the availability, affordability and acceptability of HTS at three HTS modalities: an NGO-led mobile service, an NGO-led stand-alone center and a public PHC facility. These modalities were all within 2 kilometres of one another, thus it is plausible to assume that individuals needing HTS could self-refer to any of the three modalities.

Study Population

Participants were eligible for study inclusion if they had self-referred for HTS at one of the modalities within the study area, were ≥ 18 years of age, and consented to participate in the study. Participants were excluded if they were < 18 years, had not self-referred for HTS, if they visited the HST modality but no HIV test was done or if they did not provide written informed consent. A trained research assistant approached eligible participants when they exited the HTS modality. Enrollment was sequential until 50 clients from each modality were enrolled.

Data collection

Data collection took place over 2 months (November and December 2014) at the mobile and stand-alone modalities and over 1 month (February 2015) at the public facility. The research assistant administered an electronic questionnaire using a hand held digital device, which automatically generated a unique study number for each participant (participant names were not collected). No information was collected that could have linked the participant to their HIV test result.

The electronic questionnaire collected demographic data (sex and age), and closed ended questions, which addressed the participant's perspective of availability, affordability and acceptability of HTS on that day. Although the questionnaire was in English, the research assistants spoke fluent English and isiXhosa (local language in the study area) and were able to explain the meaning of the question and the choice of answers to the clients, if required.

Availability

To determine the geographic accessibility of HTS to the user, questions pertained to mode of transport and time travelled (see Table 1).

Affordability

To determine user costs, we asked questions for direct and indirect user costs (see Table 1). An "affordability score" was obtained for each participant and was calculated as follows; 0 = answered 'no/nothing' to all four questions; 1 = answered 'yes' to one of the questions; 2= answered 'yes' to two of the questions. No participants answered "yes" to more than two of the four questions. This resulted in a possible "affordability score" of 0, 1 or 2.

Acceptability

This included the participants' self-perceived quality of service received and their satisfaction with 9 non-clinical aspects of HTS (See Table 1 for questions asked). A non-clinical satisfaction score was calculated for each participant using the 9 Likert scale items ranging from 1 (very satisfied) to 5 (very dissatisfied). The minimum and maximum scores a participant could have was therefore 9 and 45 respectively.

Table 1: Questions asked for each dimension of “Access”

Dimension	Measuring	Questions asked	Possible Answers from “drop-down” menu
Availability	Geographic accessibility of HTS to the user	Did you walk here today? If not, what mode of transport did you use? How long did it take you to travel here?	Yes/No Private car, Taxi, Train, Bus, Other < 30 min, 30 – 60 min, > 60 min
Affordability	Direct user costs	How much did the return trip cost you in Rand? Did the facility charge you any money to get an HIV test?	Nothing, < R20, R20 – R40, > R40 Yes/No
	Indirect user costs	Did you have to miss work to come here today? Have you lost any income because you came to this facility today?	Yes/No Yes/No
Acceptability	Self-perceived quality of service received Satisfaction with 9 non-clinical aspects of HTS	How long did you spend waiting? How long was the entire HTS process Thinking about today’s visit, how satisfied are you with.... (1) opening times (2) cleanliness (3) waiting times (4) health information (5) privacy (5) staff attitude (7) result explanation (8) time taken for HTS (9) confidentiality	< 15 min, 15 – 30 min, ≥30 min < 30 min, 30-60 min, >60 min Choose either; very satisfied, satisfied, neutral, dissatisfied or very dissatisfied

Analysis

Data from the electronic questionnaire were downloaded into a Microsoft ACCESS database. Logistic regression analysis was used to assess differences in demographic characteristics and in availability, affordability and acceptability of HTS for participants at: (1) NGO-mobile versus the public facility, (2) NGO-stand-alone versus the public facility, and (3) NGO-stand-alone versus NGO-mobile. All variables were included in the multivariate analysis, irrespective of their association with the outcome in univariate analysis. The level of significance in all analyses was $p < 0.05$. Analyses were completed in Stata (StataCorp. 2011. Stata Statistical Software: Release 14. College Station, Texas, USA: StatCorp LP).

Ethics Approval

The Health Research Ethics Committee of Stellenbosch University (S12/02/059) approved the study. The CCT Health Department granted permission (ID 10463) to enroll participants at the public facility. There were no incentives for testing or for participation in the study. All participants provided written informed consent, could discontinue with the questionnaire early or decline to answer any questions without any negative consequences.

RESULTS

Overall, 151 participants were initially enrolled in the study. Thereafter 21 (14%) participants were excluded from the analysis for the following reasons: did not self-refer for HTS (17 at public facility and 1 at mobile), age <18 years (2 at stand-alone), did not have an HIV test (1 at stand-alone). In total 130 participants were eligible for analysis: 50 from mobile, 49 from stand-alone and 31 from the public facility.

Sex and Age

Table 2 shows that 40% of participants at mobile were male, 25% at stand-alone and 26% at the public facility were male. There was no significant difference in the proportion of males between modalities.

The median age of participants at mobile and stand-alone was 28 years (IQR: 23-37) and 27 years (IQR: 23-36) respectively. At the public facility, median age was 30 years (IQR: 23-34). More than a third of participants at mobile and stand-alone were within the age category 18-24 years. Almost half of participants at the public facility were within the age category 30-39 years.

Availability

Irrespective of modality, the majority of participants walked to HTS and reported a travel time of less than 30 minutes (Table 2). There was no significant difference in mode of transport or travel time between modalities.

Affordability

The majority of participants, irrespective of modality, had an affordability score of 0 (reported no costs incurred to access HTS) (Table 2). There was no significant difference in affordability between modalities.

Acceptability

There were significant differences in the reported waiting time between the modalities. Table 2 shows that the proportion of participants reporting the shortest waiting time (<15 minutes) was highest for those that utilized mobile HTS (86%) compared to stand-alone (57%) and public facility (13%).

Participants at mobile compared to the public facility were less likely to report waiting times ≥ 30 minutes compared to <15 minutes (aOR <0.001, 95%CI<0.001-0.03). Participants at stand-alone compared to mobile were more likely to report waiting times of 15-30 minutes compared to <15 minutes (aOR 5.4, 95%CI 1.6-18.7). See Table 3.

Majority of participants at the mobile and stand-alone services reported a duration of less than 30 minutes of the entire HTS process (100% and 86% respectively), whereas only 23% of participants at the public facility reported a similar duration (Table 2).

The majority of participants, irrespective of which HTS modality utilized, reported to be very satisfied with their HTS experience. All participants had a satisfaction score between 9 and 17 (possible range was 9-45, the lower the score, the more satisfied). Participants utilizing mobile and stand-alone were significantly more satisfied compared to participants utilizing the PHC facility ($p=0.024$ and $p=0.005$ respectively). There was no significant difference in satisfaction scores for participants at the mobile compared to stand-alone (Table 3).

Figure 1 shows that the highest possible satisfaction score (9, meaning 'very satisfied' on all 9 non-clinical aspects of HTS) was reported by the majority of participants who utilized mobile and stand-alone (68% and 76%, respectively). Lower levels of satisfaction (range 13-17) were only reported by participants that utilized the public facility.

Table 2: Participant demographics and availability, affordability and acceptability of HIV testing services (HTS) by modality, Cape Town, South Africa

	NGO Mobile n (%)	NGO Stand-alone n (%)	Public PHC Facility n (%)
Total	50	49	31
Sex			
Male	20 (40)	12 (25)	8 (26)
Female	30 (60)	37 (75)	23 (74)
Age (years)			
Median (IQR)	28 (23-37)	27 (23-36)	30 (23-34)
18-24	16 (32)	18 (37)	9 (29)
25-29	11 (22)	12 (24)	5 (16)
30-39	13 (26)	8 (16)	14 (45)
≥40	10 (20)	11 (22)	3 (10)
Availability			
Mode of transport			
Walking	39 (78)	41 (84)	25 (81)
Private car	3 (06)	0	0
Public transport (taxi, bus)	8 (16)	8 (16)	6 (19)
Time travelled			
<30 min	46 (92)	41 (84)	21 (68)
≥30 min	4 (08)	8 (16)	10 (32)
Affordability			
Score (in)direct costs HTS visit¹ (the higher, the more costs)			
0	40 (80)	37 (76)	20 (65)
1	10 (20)	10 (20)	8 (26)
2	0	2 (04)	3 (10)
Acceptability			
Waiting time			
<15 min	43 (86)	28 (57)	4 (13)
15-30 min	6 (12)	15 (31)	4 (13)
≥30 min	1 (02)	6 (12)	23 (74)
Time taken for HTS			
<30 min	50 (100)	42 (86)	7 (23)
30-60	0	5 (10)	18 (58)
>60	0	2 (4)	6 (19)
Satisfaction score² (the lower, the more satisfied)			
Median (IQR)	9 (9-11)	9 (9-9)	11 (9-12)

Footnotes

IQR = Inter Quartile Range

PHC = Primary Healthcare

¹ Questions that determined the score of direct and indirect costs for an HTS visit for each participant enrolled:

1. Did the return trip cost you anything? [nothing, yes]
2. Did the facility charge you any money to get an HIV test? [no, yes]
3. Did you have to miss work to come here today? [no, yes]
4. Have you lost any income because you came to this facility today? [no, yes]

Interpretation of score (in)direct costs HTS visit:

0 = answered 'no/nothing' at all four questions; 1 = answered 'yes' at only one out of four questions; 2 = answered 'yes' at maximal two out of four questions (other options than 0, 1, 2, did not occur)

² Satisfaction score was coded as: there were 9 non-clinical aspects of HTS (opening times, cleanliness, waiting times, health information received, privacy, staff attitude, result explanation, time taken for HTS and confidentiality). Participants had to rate their experience ranging from 1 (very satisfied) to 5 (very dissatisfied). The minimum score was therefore 9 and the maximum score was 45. All enrolled participants scored between 9 and 17.

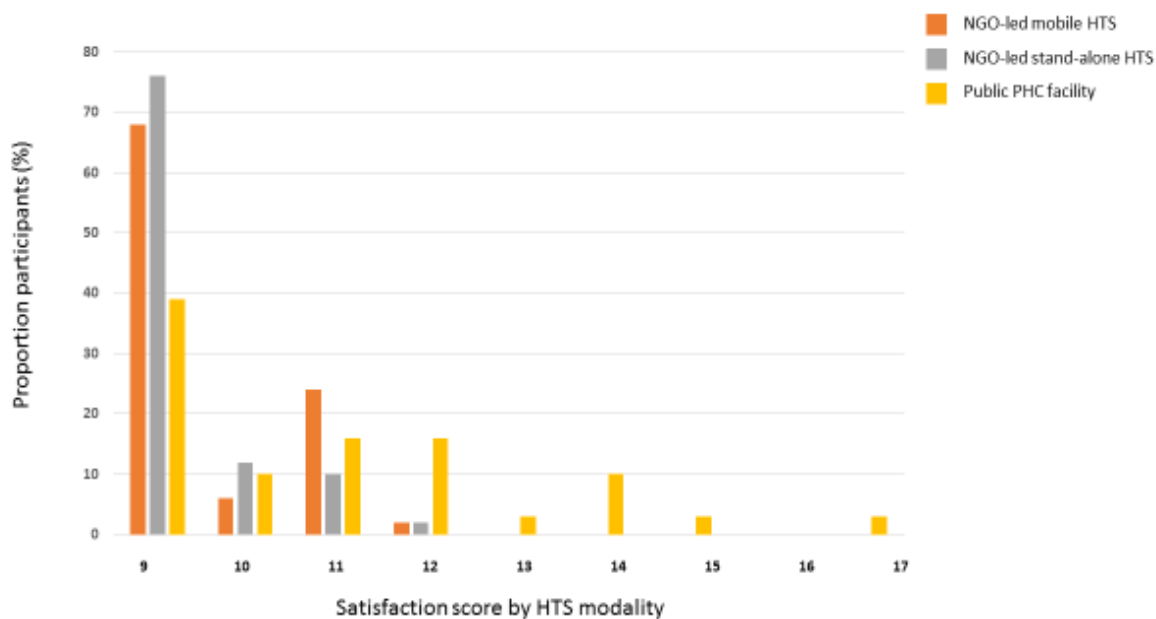


Figure 1: Distribution of satisfaction scores across HTS modality in Cape Town, South Africa

Table 3: Univariable and multivariable associations between participants' demographic characteristics and availability, affordability and acceptability of HIV testing services (HTS) at three HTS modalities in Cape Town, South Africa

	NGO-Mobile vs Public Facility				NGO-Stand-alone vs Public Facility				NGO-Stand-alone vs NGO-Mobile			
	Univariable		Multivariable		Univariable		Multivariable		Univariable		Multivariable	
	OR (95% CI)	p-value	aOR (95% CI)	p-value	OR (95% CI)	p-value	aOR (95% CI)	p-value	OR (95% CI)	p-value	aOR (95% CI)	p-value
Sex												
Male	1		1		1		1		1			
Female	0.5 (0.2-1.4)	0.195	0.04 (0.001-1.0)	0.051	1.07 (0.4-3.0)	0.895	0.06 (0.001-3.3)	0.172	2.1 (0.9-4.9)	0.102	2.6 (0.9-7.0)	0.068
Age (years)												
Median (IQR)												
18-24	1		1		1		1		1		1	
25-29	1.2 (0.3-4.7)	0.755	3.4 (0.1-119.6)	0.494	1.2 (0.3-4.5)	0.786	4.7 (0.1-421.7)	0.503	0.9 (0.3-2.8)	0.955	1.3 (0.4-4.4)	0.677
30-39	0.5 (0.2-1.6)	0.252	0.3 (0.02-4.9)	0.399	0.3 (0.09-0.9)	0.038	0.1 (0.005-1.9)	0.129	0.5 (0.2-1.7)	0.286	0.5 (0.1-1.7)	0.261
≥40	1.9 (0.4-8.6)	0.420	0.6 (0.02-20.7)	0.767	1.8 (0.4-8.3)	0.430	33.4 (0.7-1572.9)	0.074	0.9 (0.3-2.9)	0.968	0.6 (0.2-2.3)	0.474
Availability												
Mode of transport¹												
Walking	1		1		1		1		1		1	
Private car	1.2 (0.4-3.6)	0.776	3.8 (0.1-212.5)	0.521	0.8 (0.3-2.6)	0.729	0.6 (0.001-227.9)	0.860	0.7 (0.3-1.9)	0.475	0.3 (0.04-2.1)	0.234
Public transport (taxi, bus)												
Time travelled												
<30 min	1		1		1		1		1		1	
≥30 min	0.2 (0.1-0.6)	0.009	0.1 (0.003-1.8)	0.105	0.4 (0.1-1.2)	0.102	0.1 (0.001-2.3)	0.129	2.2 (0.6-8.0)	0.213	2.9 (0.7-12.9)	0.161
Affordability												
Score (in)direct costs HTS visit^{2, 3} (the higher, the more costs)												
0	1		1		1		1		1		1	
1	0.5 (0.2-1.2)	0.126	0.1 (<0.001-3.6)	0.176	0.7 (0.2-1.9)	0.476	0.05 (<0.001-26.2)	0.354	1.3 (0.5-3.4)	0.592	3.8 (0.6-24.9)	0.157
2					0.4 (0.1-2.3)	0.285	9.1 (0.03-2406.4)	0.438				
Acceptability												
Waiting time												
<15 min	1		1		1		1		1		1	
15-30 min	0.1 (0.02-0.7)	0.018	0.03 (0.002-0.6)	0.019	0.5 (0.1-2.5)	0.421	0.7 (0.02-27.1)	0.862	3.8 (1.3-11.1)	0.013	5.4 (1.6-18.7)	0.007
≥30 min	0.004 (<0.001-0.04)	<0.001	<0.001 (<0.001-0.03)	<0.001	0.04 (0.01-0.1)	<0.001	0.01 (<0.001-1.0)	0.051	9.2 (1.1-80.7)	0.045	11.4 (1.1-116.6)	0.040
Time taken for HTS⁴												
<30 min					1		1					
30-60					0.05 (0.01-0.2)	<0.001	0.02 (<0.001-1.0)	0.051				
>60					0.06 (0.01-0.3)	0.002	0.01 (<0.001-0.7)	0.034				

Satisfaction score ⁵ (the lower, the more satisfied)											
Median (IQR)	0.5 (0.4-0.8)	0.001	0.4 (0.2-0.9)	0.024	0.4 (0.3-0.7)	<0.001	0.2 (0.1-0.6)	0.005	0.7 (0.5-1.2)	0.216	0.7 (0.4-1.2) 0.199

Footnotes

IQR = Inter Quartile Range

OR = Odds Ratio

aOR = adjusted Odds Ratio

CI = Confidence Interval

¹Categories 'Private car' and 'Public transport' were combined in all three regression analyses

²Questions that determined the score of direct and indirect costs for an HTS visit for each participant enrolled:

1. Did the return trip cost you anything? [nothing, yes]
2. Did the facility charge you any money to get an HIV test? [no, yes]
3. Did you have to miss work to come here today? [no, yes]
4. Have you lost any income because you came to this facility today? [no, yes]

Interpretation of score (in) direct costs HTS visit:

0 = answered 'no/nothing' at all four questions; 1 = answered 'yes' at only one out of four questions; 2 = answered 'yes' at maximal two out of four questions (other options than 0, 1, 2, did not occur)

³Categories 'score 1' and 'score 2' were combined in the regression analyses comparing (i) Mobile vs Public and (ii) Stand-alone vs Public

DISCUSSION

Improving access to HIV testing services is vital to increase the number of people who test and are aware of their HIV-positive status. This study, analyzed access to HTS for those who self-referred for an HIV test at NGO-managed mobile and stand-alone modalities compared to a public facility. Of those included in the study, there was a larger proportion of men at the mobile compared to the public facility and the stand-alone, although these differences were not significant. Previous studies show that mobile HTS is utilized by a higher proportion of men compared to other HTS modalities (4)(15)(14), while women tend to access public facilities (18).

Irrespective of modality, the majority of participants walked to HTS and reported a travel time of less than 30 minutes. This highlights close proximity of HTS to the user. This finding agrees with previous studies that showed mobile services as conveniently situated in communities (14), providing users with the immediate opportunity to test (13) and that physical proximity of healthcare is no longer a problem for reaching public facilities (19). Findings may be different in rural settings, where service proximity from the user may be further.

The majority of participants reported no costs related to utilizing HTS, making HIV testing affordable to the user in our setting. This finding differs from previous studies that found the cost to get to a health service a challenge (20)(21)(22). In areas outside of our setting, where there may be longer distances between public facilities and users, reducing proximity of testing services to users is one way to reduce transport costs, making mobile HTS a viable consideration.

Participants at the public facility reported longer waiting times compared to those at the mobile and stand-alone. Levels of dissatisfaction with waiting times at public health care facilities in South Africa has been widely reported (19)(23)(24)(18). Longer waiting times are expected at public facilities, due to high patient loads because of the number of services offered (not only HTS), but may be a barrier to service uptake. Addressing staff shortages and improving patient flow (25) may reduce waiting times. Future operational research is required to identify which interventions will be most effective in reducing waiting times in different contexts.

Although, the majority of participants reported to be very satisfied with their HTS experience, those who utilized mobile and stand-alone reported to be more satisfied than those utilizing the public facility did. Satisfaction is a subjective concept and self-reported perceptions are often

driven by previous experiences (11). In addition, the small sample size limits generalizability. However, our findings replicate findings in previous studies; high levels of patient acceptability reported for mobile HTS (14), mobile HTS was found more acceptable than HTS at public facilities for waiting times, cleanliness and perceived friendliness of staff (13). Our study showed that although user satisfaction at the public facility was high, satisfaction levels were more widely distributed than at mobile and stand-alone.

A major strength of this study is that it was able to compare three dimensions of access (availability, affordability and acceptability) across three different HTS modalities (two NGO-led modalities and a public PHC facility). While many studies differentiate NGO-led and public HTS in terms of the different populations they reach and clinical outcomes, there is limited literature comparing how available, affordable and acceptable these different HIV testing modalities are from a user's perspective. When formulating policy aimed at increasing access to HTS, it is essential to understand the user's perspective (26). The small sample size is noted as a limitation; the study needs to be repeated in a larger population sample in order to make conclusive statements that can inform policy aimed at increasing access to HTS.

In this study, we did not record people who had self-referred for an HIV test, but who did not enroll in the study, potentially introducing selection bias. The data was self-reported, which may have biased the results, however the main findings concur with similar South African studies. The study required users to report their experience of the HTS modality they had just utilized. Many individuals have tested for HIV multiple times and future studies should consider the perspective of users, who have utilized two or more different HTS modalities, to provide rich comparative data. This study, like most other studies, also included only people who have actually tested for HIV. Those who may have left the service before having the HIV test and those who have never tested for HIV were not included and therefore their perspectives are not documented.

CONCLUSION

HIV testing services, irrespective of modality, were available and affordable in our study with no difference between NGO-mobile, NGO-stand-alone and the public facility. However, when it comes to acceptability of services from a user's perspective, the waiting times were significantly higher and the satisfaction scores lower at the public facility compared to the mobile and stand-alone. As South Africa moves toward achieving the first UNAIDS target, it is essential to make HTS not only available and affordable, but also acceptable to clients,

especially to those who have never tested before. Future studies should include participants who have never tested for HIV, to gain a further perspective on access to HTS.

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CHAPTER 5: WHAT DRIVES “FIRST TIME TESTERS” TO TEST FOR HIV AT COMMUNITY-BASED HIV TESTING SERVICES?

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My contribution to this study: I am first author on this manuscript. I conceived of and designed the study. I employed and trained the research assistants and managed the overall process of data collection. I worked with the statistician on the analysis and was responsible for the interpretation of data. I wrote the initial manuscript, made revisions as per all the co-author suggestions and submitted the manuscript for publication. H. Draper was the statistician, who also assisted with the interpretation. N. Beyers and R. Burger provided oversight on the analysis and interpretation. All co-authors provided comment and approval on the manuscript prior to submission for publication.

ABSTRACT

Drivers and barriers to testing are not well understood for those who have never tested previously and now self-initiate at a community-based HIV testing service (CB-HTS). This descriptive study enrolled 229 first-time testers. Participants completed an electronic questionnaire. The majority reported fear and (non) accessibility of HTS as barriers to testing (40% and 24%, respectively). Wanting to “know my status” and the immediate opportunity to test were reported as drivers to testing (41% and 35%, respectively). Addressing individuals’ fear of testing and providing an easily accessible opportunity to test may go some way to getting those previously untested, to test.

INTRODUCTION

The UNAIDS '90-90-90' target aims to bring the global HIV epidemic under control (1). HIV testing is essential for reaching the first '90' (90% of HIV-infected people aware of their status) and increasing access to HIV testing services (HTS), specifically for those who have never tested and remain unaware of their HIV status. South Africa has a large burden of HIV (2). Although an estimated 7.6 million South Africans tested for HIV for the first time during a national HIV testing campaign (2010/2011) (3), mathematical modelling estimates that 23% of HIV positive adults remain undiagnosed (4).

Drivers and barriers to testing are not well understood for those who test for the first time at community-based HTS. There is a paucity of data from first time testers, specifically what prevented them from testing previously and what has driven them to test now. This is important to understand, as community-based HTS have a significant role to play in expanding HTS; especially for those who do not typically utilise public health facilities, for example males (5) (6).

This study describes self-reported drivers and barriers to testing for first time testers who tested for HIV at a community-based HTS.

METHODS

Design and Setting

This cross sectional descriptive study was embedded within routine community-based HTS provided by non-governmental organisations (NGOs) in five under-developed, densely populated communities with high HIV prevalence (7), in Cape Town City, Western Cape Province of South Africa. Within each community, NGO-led HIV testing was available at a stand-alone center (fixed site) and on a mobile basis (using pop-up tents and a mobile van). All HIV rapid testing was done in accordance with provincial algorithms and guidelines. Clients diagnosed with HIV were referred for HIV care and treatment at public health facilities.

Study population and enrolment

Adults (≥ 18 years) who self-initiated an HIV test (voluntarily decided to learn their HIV status) at either of the NGO-led HTS within one of the five study communities, reported to be first time testers and provided written informed consent, were eligible. Participants were enrolled sequentially after their HIV test, while waiting for their HIV test result, so that HIV status did not bias participant responses to the questionnaire.

Data collection and analysis

An electronic questionnaire was administered by trained research assistants (RAs) using a hand held device. It took ≤ 10 minutes to complete and consisted of simple closed-ended questions. Participants chose a pre-determined answer from a drop down menu. If none of the pre-determined choices were applicable, they chose “other” and the RAs captured the participant’s answer. Data was downloaded from the hand-held devices into a specifically designed database (Microsoft ACCESS 2013). Data collection took place in all 5 communities between April and December 2015. For drivers and barriers to testing, the first author grouped similar reasons (from the drop-down menu and “other”) together to form broad categories (See Table 1). These categories are displayed using frequencies and percentages.

Ethical considerations

The study was approved by the Health Research Ethics Committee at Stellenbosch University (S12/02/059). All participants provided written informed consent; they could withdraw from the study at any time and did not receive any incentive to take part in the study.

Table 1: Barriers and drivers for HIV testing as reported by first-time testers

Barriers to HIV testing				
Fear	(non) Accessibility	Low risk/low perceived risk for HIV	Lack of awareness	Health system issues
Fear of being seen	Health facility opening hours	I was not sexually active	Ignorance around HIV/testing	Disrespectful health professionals
Fear of testing HIV positive	I could never take time off work	I trust my partner/s	Never heard of HCT before	Poorly trained health professionals
General fear	Long queues in health facilities Too far to travel I have been too busy	I am in a faithful relationship I take precautions	HIV testing is not important	Accuracy of HIV tests untrustworthy
Drivers for HIV testing				
Wanted to know my status	Opportunity to test	Perceived risk of HIV	Knew someone with HIV	Other
I wanted to know my status	Was just passing Offered a test when at another service	Unfaithful partner Multiple partners Don't use condoms consistently Had unsafe sex Window period Partner is HIV-infected Raped Sexually active	Knew someone living with HIV Knew someone who died from Aids	Feeling ill/signs of illness Pregnant/planning a baby To protect my partner Medical male circumcision To show my mother Try to find a partner Never tested before

RESULTS

The analysis included data from 229 first-time testers with a median age of 24 years (IQR: 20-42), the majority (66%) were male. See Table 2. Participant reasons for never having tested previously (barriers) were grouped into five categories, with the majority reporting either fear (40%) or the non-accessibility of HTS (24%).

Table 2: Age and Barriers to HIV testing reported by First Time Testers

	Total (n=229)	Males (n=152)	Females (n=77)
Median age in yrs (IQR)	24 (20-42)	24 (20-38)	27 (19-49)
Reasons for not testing previously			
Fear (%)	91 (40)	54 (36)	37 (48)
(non) Accessibility (%)	54 (24)	41 (27)	13 (17)
Low risk/low perceived risk for HIV (%)	37 (16)	22 (14)	15 (19)
Lack of awareness (%)	32 (14)	26 (17)	6 (08)
Health system issues (%)	15 (06)	9 (06)	6 (08)

Participant reasons for having decided to have an HIV test for the first time (drivers) were grouped into four categories. The majority reported that they just want to know their HIV status (41%) and that there was an opportunity to test (35%). See Table 3.

Table 3: Drivers for HIV testing reported by First Time Testers

	Total (n=229)	Male (n=152)	Female (n=77)
Wanted to know my status (%)	93 (41)	62 (41)	31 (40)
Opportunity to test (%)	81 (35)	55 (36)	26 (34)
Perceived risk of HIV n (%)	32 (14)	23 (15)	9 (12)
Knew someone with HIV/AIDS (%)	12 (5)	4 (3)	8 (10)
Other (%)	10 (4)	7 (4)	3 (4)
Missing*	1 (1)	1 (1)	0 (0)

* no reason given.

DISCUSSION

It is encouraging that the majority of participants were male; we know that men are less likely to visit a health facility for HTS (8) and have a higher proportion of undiagnosed HIV compared to women (4).

The reporting of fear as a major barrier to testing may indicate the presence of stigma (9)(10). To reduce HIV-associated stigma and encourage earlier testing, it may be beneficial to position HIV as a chronic illness. Using chronic illness clubs to dispense treatment to stable HIV patients, may be one intervention that can help normalise HIV in communities. Further studies could test this.

Participants decided to test because they wanted to know their status. “Know your status” is a phrase used in awareness campaigns in South Africa. Participants reporting this may be masking actual underlying reasons e.g. a perceived risk for HIV. It may also indicate awareness around the importance of knowing one’s HIV status and provide evidence that the awareness campaigns are working.

While (non) accessibility of HTS was noted as a barrier to testing, opportunity to test was noted as a driver. Participants were able to take up the immediate opportunity to test as they walked past the NGO-led HTS. This highlights proximity to a testing service as a driver for HIV testing.

This study is relevant as it relates to the first ‘90’ in the UNAIDS target. Its’ strength is that it describes self-reported reasons by first time testers; why they had never tested previously and why they chose to test for the first time at a community-based HTS. The study has limitations. It did not collect data on those who refused participation. Secondly, it was conducted in peri-urban communities; barriers and drivers to testing may be different for rural areas, an opportunity for future research. Future studies could also compare differences between first time testers and repeat testers and individuals who have never tested for HIV.

This study indicates that people who self-initiate an HIV test for the first time want to know their HIV status. This work would suggest that addressing individuals’ fear of testing and providing people with an easily accessible opportunity to test could go some way to getting those previously untested, to test for HIV and ultimately in attaining the first ‘90’, but it would be important to confirm these hypotheses via conversations with those who have never tested at all. Undisputedly, public health services will remain core to HIV test provision, but community-based HTS can reach “opportunistic” testers.

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CHAPTER 6: FACTORS ASSOCIATED WITH LINKAGE TO HIV CARE AND TB TREATMENT AT COMMUNITY-BASED HIV TESTING SERVICES IN CAPE TOWN, SOUTH AFRICA.

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My contribution to the study: I am first author on this manuscript. I conceived the study design. I oversaw data collection and data management. I was involved in the analysis and interpretation of data. I wrote the manuscript, made revisions as per co-author comments and submitted the manuscript for publication. R. Sloom and H. Draper were involved in the study design, analysis and interpretation of data. P. Naidoo, R. Burger and N. Beyers provided input into the study design, analysis and interpretation. N. Beyers also played a supervisory role. All co-authors provided input into the manuscript prior to submission to the journal for publication.

ABSTRACT

Background: Diagnosing HIV and/or TB is not sufficient; linkage to care and treatment is conditional to reduce the burden of disease. This study aimed to determine factors associated with linkage to HIV care and TB treatment at community-based services in Cape Town, South Africa.

Methods: This retrospective cohort study utilized routinely collected data from clients who utilized stand-alone (fixed site) and mobile HIV testing services in eight communities in the City of Cape Town Metropolitan district, between January 2008 and June 2012. Clients were included in the analysis if they were ≥ 12 years and had a known HIV status. We measured self-reported linkage to HIV care and/or TB treatment.

Results: Overall linkage to HIV care was 63%. Linkage to HIV care was associated with the type of HIV testing service. Clients diagnosed with HIV at a stand-alone service were significantly more likely to link to care as compared to those diagnosed at mobile services (aOR 1.5 (CI 95%: 1.3-1.7). Overall linkage to TB treatment was 76%. Linkage to TB treatment was associated with age. Clients in the age groups 25-34, 35-44 and ≥ 45 years were less likely to link to TB treatment compared to clients in the age group 12-24 years (all, p-value <0.05).

Conclusion: It is feasible to diagnosis HIV and TB and link clients to care at community-based services. However, a large proportion of clients diagnosed with HIV at mobile services did not link to care and improving linkage to care at mobile services could have a considerable impact. Future studies are required to investigate factors associated with linkage to care at community-based services, to design interventions that facilitate improved linkage to care in similar HIV and TB high-burden settings.

INTRODUCTION

Globally, the “90-90-90” target has been adopted to end the Acquired Immune Deficiency Syndrome (AIDS) epidemic (1). South Africa has the largest burden of human immunodeficiency virus (HIV) worldwide, with 7.1 million individuals living with HIV (2). More than 50% of new tuberculosis (TB) cases are among HIV-infected individuals (3) and TB remains the most common cause of death among HIV-infected adults (4). The World Health Organization (WHO) emphasises the need to integrate tuberculosis (TB) screening practices into HIV Testing Services (HTS) (5). The South African Department of Health strongly advocates that HIV services should be used as an entry point for TB screening (6) as South Africa strives toward identifying 90% of individuals with HIV and TB and getting 90% of these individuals started on treatment (6).

In South Africa, utilization of HTS occurs predominantly at public health facilities (7). Although anyone can test for HIV on their own initiative, public health facilities primarily use a provider-initiated testing strategy, whereby health providers are required to recommend HIV testing to everyone attending health facilities, regardless of whether they have symptoms of HIV (8). This has been shown to be effective in increasing the number of people who test for HIV (9)(10)(11). However, specific subgroups, such as males, are underrepresented in health facilities, (12), hampering access to HIV services for these populations.

Community-based HTS provided on a mobile basis or at stand-alone centers provide a different service offering from the existing public health facilities. Mobile services reach different populations compared to facility-based services; they are more likely to reach males (13), youth (≤ 25 years) (14) and older individuals (≥ 31 years) (15)(16). Compared to mobile services, stand-alone services have a higher proportion of individuals who test HIV positive (17) (18).

Linkage to care for individuals diagnosed with HIV and/or TB is essential for individual treatment initiation and for reaching the UNAIDS target. While an estimated 86% of HIV-infected South Africans know their status, only 56% were on antiretroviral therapy (ART) in 2016 (2). For TB, an estimated 25% of smear-positive TB patients never start treatment (19). These data emphasise the gap between diagnosis and linkage to care and treatment for both HIV and TB.

Linkage to care is sub-optimal. Linkage to HIV care is estimated at 55% from facility-based provider-initiated testing (20), at 60% from facility-based self-initiated testing (20) (21) and

53% from community-based mobile services (22). No known published linkage to care data exists at stand-alone services. While community-based services can diagnose HIV and TB among individuals who typically do not access public health facilities (9), there exists limited data around linkage to HIV care and TB treatment from integrated community-based HTS.

Factors associated with linkage to HIV care differ across studies and include: demographic factors, for example age (23) or employment status (24); clinical factors, for example CD4 counts (24); psychosocial factors, for example their health seeking behaviour (25), acceptance of the HIV test result (23)(26) or perception of whether they require care (27); and health service factors, for example where services are provided in proximity to the patient (25), providing official referrals to care (26), facilitated linkage (20), and peer support (28).

Although many studies exist, there is a paucity of data from operational settings and a gap exists for linkage to care data from routinely offered community-based HTS where HIV testing and TB screening services are integrated. To address this gap, this study aimed to determine factors associated with linkage to HIV care and TB treatment at community-based HTS in Cape Town, South Africa.

METHODS

Design and setting

This retrospective cohort study used routinely collected data from clients that attended community-based HTS (stand-alone and mobile) between January 2008 and June 2012 in the City of Cape Town Metropolitan district of the Western Cape Province of South Africa. This district houses 66% of the provincial population, has an antenatal HIV prevalence of 20.4% (29), and has extremely high rates of both HIV-associated and non-HIV-associated TB (30). More than 100 primary healthcare facilities offer HIV and TB treatment in the district (31). This study was conducted within eight communities in this district, all of which are characterized by low socio-economic status (32) and high HIV (33) and TB disease burden (30).

In each of these eight communities, community-based HTS integrating HIV and TB screening, diagnosis and linkage to care was provided at one stand-alone and one mobile service. Stand-alone services were located in shopping malls or residential areas and were fixed in one location for the duration of the study, while mobile services were provided from tents and a caravan (mobile van), strategically set up at various locations within the community, such as transport

hubs and along busy thoroughfares. The locations for mobile services were selected on an ad hoc basis and changed regularly over the course of the study period. Anyone could walk in without an appointment and request an HIV test at either of the stand-alone or mobile.

All clients self-initiated HTS and underwent pre-test counselling; they were symptomatically screened for TB and consent was taken for an HIV test. All clinical services provided at the mobile and stand-alone were in accordance with Western Cape provincial guidelines. A client was diagnosed HIV positive if both the screening and confirmatory rapid test results were positive. If the rapid screening test was positive, but the rapid confirmatory test was negative (discrepant result), blood was drawn and sent to the National Health Laboratory Service (NHLS) for an enzyme-linked immunosorbent assay (ELISA). The HIV rapid test results were provided during post-test counselling. A client with a discrepant result received the appropriate counselling and was recalled when their ELISA result was available, approximately a week later. Clients diagnosed with HIV were offered a referral letter for HIV care at a public health facility of their choice.

A TB screening tool was used to screen all clients for TB symptoms (cough ≥ 2 weeks, weight loss >1.5 kg, drenching night sweats, fever). Clients who reported one or more symptoms were regarded as presumptive TB cases and two sputum specimens taken at least one hour apart, were sent to the NHLS for TB testing according to the national TB testing algorithm at the time (smear microscopy for all presumptive TB cases and culture for previously treated individuals and smear-negative HIV-infected individuals). A client was diagnosed with TB if the microscopy and/or culture result was positive. All clients with TB were contacted telephonically, recalled to the HIV testing service and provided with a referral letter to a public health facility of their choice to initiate TB treatment.

All clients diagnosed with HIV and/or TB were followed up telephonically, by a health care worker, to confirm whether they linked to care or not. Linkage to HIV care and / or TB treatment was defined as self-reported attendance at a public health facility for HIV care / TB treatment within 3 months after being diagnosed at a community-based HIV testing service. If a client reported that they had visited a public health facility for HIV care and/or TB treatment, the healthcare worker recorded that they had linked to care. If clients could not be contacted telephonically initially, at least three more attempts were made at various times of the day over a 3-month period.

At the beginning of the study period (January 2008) all HIV-positive individuals who had a CD4 count of ≤ 200 cells/mm³ (34) were offered ART at the public health facility. In 2010, the policy changed and ART was offered to HIV-positive individuals with CD4 ≤ 350 cells/mm³ (35) and to all individuals co-infected with TB, irrespective of CD4 count (35). Currently all HIV positive individuals are offered ART regardless CD4 count (36). Throughout the study period, all clients diagnosed with TB were eligible for TB treatment (37).

Data collection

The study included data from clients who utilized the stand-alone or mobile services between January 2008 and June 2012. At both services, healthcare workers routinely captured data of each client on paper record forms similar to those used in the Western Cape health facilities; including demographic and clinical variables and linkage to care. Each client record had a unique barcode for study purposes. Client records were kept at the HIV testing service for three months before being transported to a central data office. A Microsoft ACCESS 2013 database was specifically designed for this study. Two independent data clerks entered data into two separate datasets, after scanning the client's unique barcode into the dataset. After comparing the two datasets, a third data clerk validated any differences after referring to the source data (paper forms). This resulted in a final anonymized dataset, with no individual identifiers. All clients ≥ 12 years, who had an HIV test done and a documented HIV test result, were included in the analysis.

Statistical Analysis

This study had two primary outcomes of interest: 1) linkage to HIV care among clients diagnosed with HIV at HTS; 2) linkage to TB treatment among clients diagnosed with TB at HTS. Determinants (sex, age, HIV testing service and co-infection status) were identified using logistic regression. In order to adjust for correlated data (two HTS services were located within the same community), generalised estimating equations (GEE) were used. All variables were included in the multivariate analysis, irrespective of their association with the outcome in univariate analysis. The level of significance in all analyses was $p < 0.05$. Analyses was completed in Stata (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, Texas, USA: StatCorp LP).

Ethics Approval

The Health Research Ethics Committee of Stellenbosch University (N08/10/307) approved the study, which was conducted according to the guiding principles within the Declaration of

Helsinki. All clients who underwent an HIV rapid test provided written consent on their client record form. No incentives were provided.

RESULTS

Linkage to HIV care

Of the 79 545 clients who had a known HIV test result, 5 929 (7%) were diagnosed with HIV. Of these 3 738 (63%) were linked to HIV care. See Figure 1. Of those who linked to HIV care; 1 388 (37%) were male, the median age was 30 years (IQR: 25-37) and 59 (2%) were co-infected with TB. The majority of clients linked to care were diagnosed with HIV at the mobile service (65% compared to 35% from the stand-alone service) ($p < 0.001$) See Table 1.

Table 2 shows that clients diagnosed with HIV at the stand-alone service were significantly more likely to link to care as compared to those diagnosed at mobile services (aOR 1.5 (CI 95%: 1.3-1.7). Linkage to HIV care was not associated with sex, age or TB co-infection (Table 2).

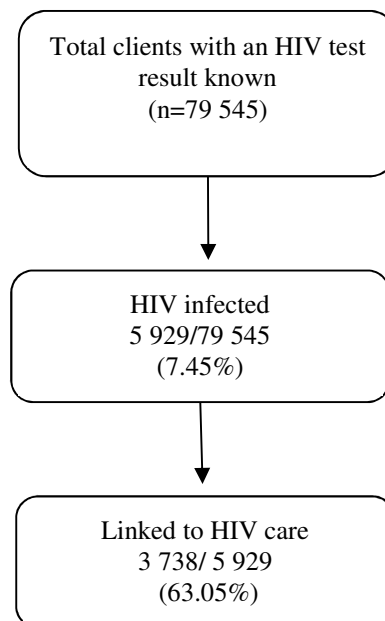


Figure 1: Linkage to HIV care for clients with known HIV status at community-based HIV testing services in the City of Cape Town Metropolitan district, Western Cape, South Africa

Table 1. Characteristics of clients diagnosed with HIV and TB at integrated community-based HIV testing services in the City of Cape Town Metropolitan district, by linkage to HIV care and TB treatment

	Clients diagnosed with HIV			Clients diagnosed with TB		
	Linked to HIV care (n, %)	Not linked to HIV care (n, %)	p-value*	Linked to TB treatment (n, %)	Not linked to TB treatment (n, %)	p-value*
Total	3,738 (63)	2,191 (37)		210 (76)	65 (24)	
Sex						
Male	1,388 (37)	771 (35)	0.133	121 (58)	44 (68)	0.147
Female	2,350 (63)	1,420 (65)		89 (42)	21 (32)	
Age (years)						
Median (IQR)	30 (25-37)	30 (25-37)	0.117**	29 (25-41)	36 (27-45)	0.007**
12-24	828 (22)	533 (24)	0.355	51 (24)	7 (11)	0.086
25-34	1,612 (43)	905 (41)		82 (39)	23 (36)	
35-44	868 (23)	502 (23)		35 (17)	15 (23)	
≥45	379 (10)	217 (10)		38 (18)	18 (28)	
Unknown	51 (1)	34 (2)		4 (2)	2 (3)	
HIV testing service						
Stand-alone	1,311 (35)	559 (26)	<0.001	121 (58)	34 (52)	0.451
Mobile	2,427 (65)	1,632 (75)		89 (42)	31 (48)	
HIV/TB co-infection						
No	3,679 (98)	2,164 (99)	0.282	137 (65)	52 (80)	0.025
Yes	59 (2)	27 (1)		73 (35)	13 (20)	
Footnotes						

* Chi-squared test, unless otherwise stated

** Mann–Whitney U-test

IQR=Interquartile range

Table 2. Factors associated with linkage to HIV care and TB treatment in the City of Cape Town Metropolitan district, South Africa

		Linkage to HIV care		Linkage to TB treatment	
		Adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Sex					
	Male	1		1	
	Female	0.9 (0.9-1.1)	0.658	1.2 (0.7-2.0)	0.426
Age (years)					
	12-24	1		1	
	25-34	1.1 (0.9-1.3)	0.064	0.5 (0.2-0.9)	0.046
	35-44	1.1 (0.9-1.3)	0.222	0.3 (0.1-0.7)	0.007
	≥45	1.1 (0.9-1.4)	0.181	0.4 (0.2-0.8)	0.019
	Unknown	1.1 (0.7-1.8)	0.681	0.4 (0.1-2.4)	0.327
HIV testing service					
	Stand-alone	1.5 (1.3-1.7)	<0.001	1.1 (0.6-1.8)	0.798
	Mobile	1		1	
HIV/TB co-infection					
	No	1		1	
	Yes	1.2 (0.7-1.8)	0.555	1.3 (0.7-2.3)	0.334

OR = odds ratio

Linkage to TB treatment

Of the 79 545 clients with known HIV status, 50 were excluded from the analysis as no TB symptom screening was done. Of the 79 495 clients screened for TB, 5 079 (6%) were presumptive TB cases, of which 4 341 (85%) were tested for TB. Of those tested, 275 (6%) were diagnosed with TB. The majority (76%) linked to TB treatment. See Figure 2.

Of those who linked to TB treatment, 121 (58%) were male. Those who initiated TB treatment were younger (median age 29 years, IQR: 25-41) compared to those who did not initiate TB treatment (median age 36 years, 95% CI: 27-45) ($p \leq 0.007$). Approximately one-third (35%) of those who linked to TB treatment were co-infected with HIV. See Table 1.

Table 2 shows that linkage to TB treatment was associated with age. Clients in the age groups 25-34 ($p=0.046$), 35-44 ($p=0.007$) and ≥ 45 years ($p=0.019$) were less likely to link to TB treatment compared to clients in the age group 12-24 years. Linkage to TB treatment was not associated with sex, HIV testing service or HIV co-infection (Table 2).

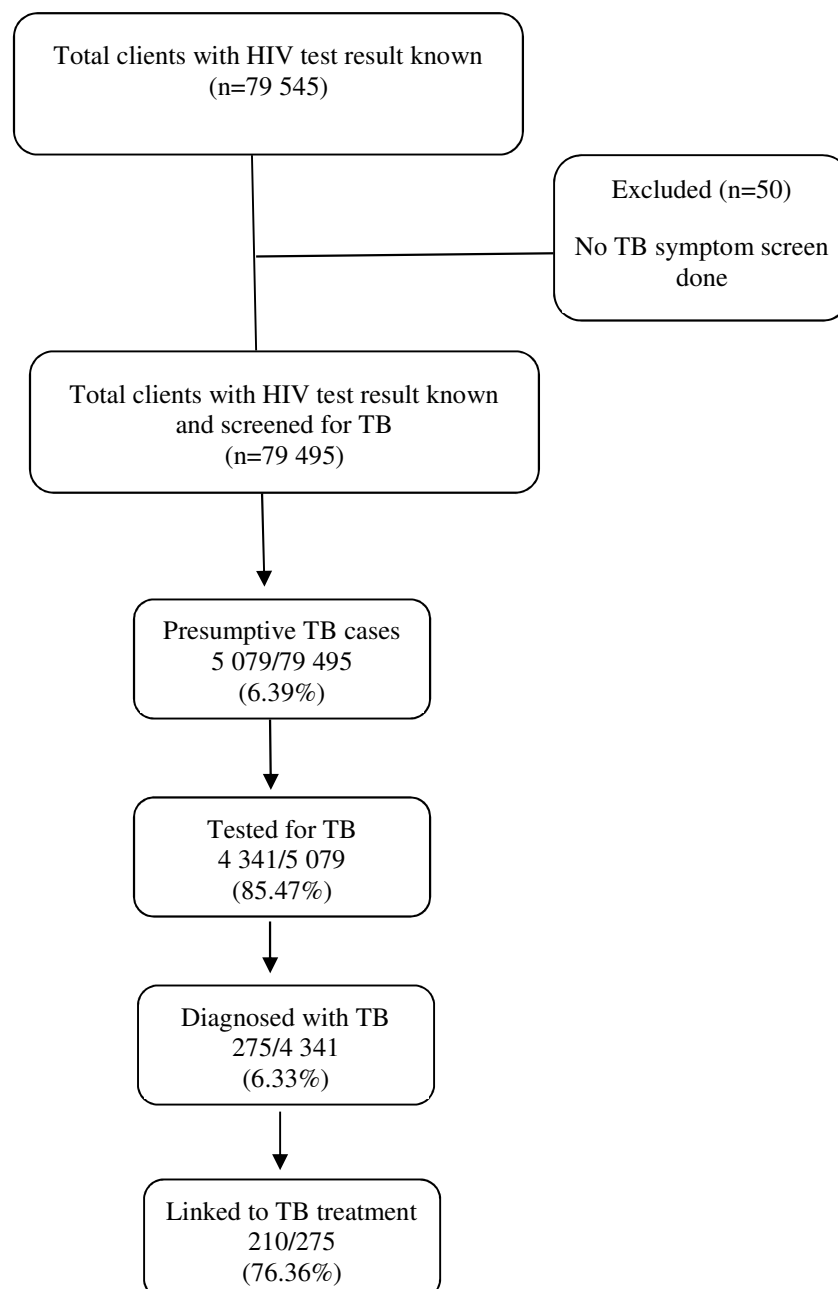


Figure 2: Linkage to TB treatment for clients with known HIV status at integrated community-based HIV testing services in the City of Cape Town Metropolitan district, Western Cape, South Africa

DISCUSSION

This study describes linkage to HIV care and TB treatment at an integrated community-based HTS, offering both HIV testing and TB screening and testing from stand-alone and mobile services, implemented within high disease burden areas around Cape Town, over a 5-year period. Overall linkage to HIV care was 63%. This is higher than what has been reported from

mobile services in other Cape Town studies (51%-53%) (22)(24). Studies use different definitions of linkage to care, making comparison difficult.

The majority of clients (2 427/3 738; 65%) that linked to HIV care were diagnosed with HIV at the mobile service; indicating the important role that mobile HTS play in diagnosing and linking large numbers of individuals with HIV, compared to stand-alone services. Of the clients who did not link to HIV care, 1 632/2 191 (75%) were diagnosed at a mobile service. This finding emphasises the need for improved linkage to HIV care interventions and suggests that efforts to improve linkage to care from mobile could have a significant impact on increasing linkage to care overall. Future operational research studies should compare different interventions at mobile services to determine more efficient linkage to care.

The type of HIV testing service (mobile or stand-alone) was associated with linkage to HIV care. Clients diagnosed at stand-alone were more likely to link to care than those diagnosed at mobile. This differs from a study in Swaziland, that found that the type of HIV testing service (mobile and home-based) was not associated with linkage to HIV care (38). Awareness of symptoms of disease has been associated with voluntary uptake of counselling and testing (39)(40). Awareness of disease may also play a role in linkage to care. Clients who accessed a stand-alone service for an HIV test may have identified signs or symptoms of disease and actively sought an HIV test. Those who tested at the mobile may have taken the immediate opportunity to test that a mobile service offers (41) and may not have been aware of any signs or symptoms of disease. The presumption that clients diagnosed at mobile were not driven to test due to their own awareness of symptoms may have delayed them linking to care. Studies have shown that individuals who are feeling “well” i.e. have higher CD4 counts (24), are asymptomatic (27), have no TB symptoms (24) are less likely to link to HIV care. Future research is required to investigate factors associated with linkage to care from community-based services to provide an empirical basis for designing interventions aimed at improving linkage to care, in particular from mobile HTS.

Sex, age and TB co-infection were not associated with linkage to HIV care. This concurs with a Cape Town study that showed age and sex did not predict linkage to care for individuals who self-initiated an HIV test at public health facilities (21), but differs from another study that found older individuals were more likely to link to care from home-based services (23). Studies from other African countries that identify factors associated with late presentation to HIV care for individuals co-infected with TB, include being male (42) and a tobacco smoker (43). Due

to the fact this study utilized routine data, there was limited information available to determine which factors may be associated with linkage to care. Studies that included demographic variables other than sex and age indicated that linkage to HIV care is associated with being a first time tester (38), being unemployed (24) and being single (38).

Overall, the majority of clients (76%) diagnosed with TB linked to treatment. This finding is higher than what was reported in another Cape Town study where 57% of individuals diagnosed with TB, linked to care from a mobile service (22). Our finding is similar to that found in individuals diagnosed with TB at public health facilities (19).

In our study, of clients diagnosed with TB, 76% linked to TB treatment compared to 63% of HIV-infected clients who linked to HIV care. We hypothesise that; (i) there were a smaller number of clients diagnosed with TB (275) compared to the number diagnosed with HIV (5 929) and healthcare workers may have found this more manageable, (ii) as pulmonary TB is infectious, healthcare workers may have made more of an effort to link these clients to care, or (iii) TB treatment was available to everyone diagnosed with TB whereas antiretroviral therapy was only available to individuals who met the eligibility criteria at the time. As point-of-care CD4 testing was not done in this study, clients would have been unaware of their eligibility for ART until they linked to HIV care. Further research is needed to test these assumptions.

Linkage to TB treatment was associated with age; clients aged 12-24 years were more likely to link to TB treatment than those in older age groups. It is acknowledged that this was a small group (n=7). Younger clients may have been easier to follow up, especially if they were still in school or this may have been their first TB episode and they may have been more motivated to link to treatment than older clients, who may have experienced previous TB treatment. More research is needed to better understand the association between age and linkage to TB treatment. Sex, HIV testing service and HIV co-infection were not associated with linkage to TB treatment. There is a lack of literature around factors associated with linkage to TB treatment from community-based HTS and more work is needed in this area.

In order to reach the '90-90-90' goals and bring the dual TB and HIV epidemics under control, improved linkage to care is essential. Although our study showed higher rates of linkage to care compared to other studies from Cape Town, these remain suboptimal. In our study setting, general messaging supported TB as a curable disease (44)(45) and HIV as a lifelong chronic

disease (46) and TB and HIV care and treatment was freely available from a multitude of primary health care facilities. We therefore speculate that other factors, apart from promoting the benefits of treatment and having treatment services available free of charge, are associated with linkage to care and treatment. While various recommendations for effective linkage to care have been suggested, including establishing an effective referral network and accompanying the patient to the health facility (47), there is still a need to better understand how various factors influence linkage to care, including stigma (48), socio-economic status (49) and awareness of signs and symptoms of disease. Only then can we design linkage to care interventions that will see 90% of HIV-infected people and those diagnosed with TB linking to care and treatment.

ART is currently available for all people living with HIV in South Africa, irrespective of CD4 count (universal test and treat (UTT)) (6)(36). We speculate that linkage to HIV care will not necessarily improve as UTT is rolled out. We hypothesise that initial awareness of signs or symptoms of disease may play a larger role in linkage to care and treatment than demographic (e.g. sex and age), clinical (e.g. diagnosed disease or co-infection) or health service factors (referral letter). Future studies should determine the impact of UTT on linkage to care from community-based HTS.

A major strength of this study is that it incorporates a large number of client records that were routinely collected from community-based HTS modalities (8 stand-alone centers and 8 mobile services), implemented locally, to generate knowledge around linkage to HIV care and TB treatment. This study adds to the limited body of literature that describes integration of TB services into community-based HIV testing and linkage to care and treatment from community-based HTS in South Africa. Secondly, this study identified the need for specific linkage to HIV care interventions from mobile HTS.

The main limitation is that linkage to care and treatment was self-reported. It was not possible to confirm linkage to care against health facility records. Acknowledging that it takes time for clients to come to terms with an HIV positive diagnosis, some clients may have linked to care after the 3-month period. Potentially, linkage to care reported in this study may be underestimated, but balanced by over-reporting of socially desirable answers given telephonically by clients. Secondly, the routine data for this study was collected during a period when eligibility criteria for ART were based on a CD4 threshold. No data on CD4 count was collected and therefore it was not possible to determine linkage to care trends over the study

period according to eligibility criteria of new guidelines. Future studies should evaluate linkage to care trends over time and the influence of eligibility criteria. Thirdly, the results are only generalizable to similar peri-urban areas; future research should determine factors associated with linkage to care for community-based services in rural settings.

CONCLUSION

If we are to reach the '90-90-90' target and bring the dual HIV and TB epidemics in South Africa under control, then improved linkage to care is vital. Community-based HTS with integrated TB screening is feasible for diagnosing and linking individuals to care. Improving linkage to HIV care from mobile services, is essential because of the higher number of individuals diagnosed with HIV but not linked to care. Future studies need to investigate other possible factors that contribute to linkage to care from community-based HIV testing services, in order to design interventions that facilitate improved linkage to care in similar HIV and TB high burden settings.

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CHAPTER 7: COST ANALYSIS OF TWO COMMUNITY-BASED HIV TESTING SERVICE MODALITIES LED BY A NON-GOVERNMENTAL ORGANIZATION IN CAPE TOWN, SOUTH AFRICA

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My contribution to this study: I am first author on this manuscript. I conceived and designed the study. I collected, analyzed and interpreted the data. I wrote the manuscript, made revisions as per co-author suggestions and submitted the manuscript for publication. N. Beyers and R. Burger both provided comment on the research design. R. Burger assisted with analysis and interpretation. N. Beyers play a supervisory role and gave comment on the analysis and interpretation. Both gave comment on the manuscript prior to submission for publication.

ABSTRACT

Background: In South Africa, the financing and sustainability of HIV services is a priority. Community-based HIV testing services (CB-HTS) play a vital role in diagnosis and linkage to HIV care for those least likely to utilise government health services. With insufficient estimates of the costs associated with CB-HTS provided by NGOs in South Africa, this cost analysis explored the cost to implement and provide services at two NGO-led CB-HTS modalities and calculated the costs associated with realizing key HIV outputs for each CB-HTS modality.

Methods: The study took place in a peri-urban area where CB-HTS were provided from a stand-alone center and mobile service. Using a service provider (NGO) perspective, all inputs were allocated by HTS modality with shared costs apportioned according to client volume or personnel time. We calculated the total cost of each HTS modality and the cost categories (personnel, capital and recurring goods/services) across each HTS modality. Costs were divided into seven pre-determined project components, used to examine cost drivers. HIV outputs were analysed for each HTS modality and the mean cost for each HIV output was calculated per HTS modality.

Results: The annual cost of the stand-alone and mobile modalities was \$96 616 and \$77 764 respectively, with personnel costs accounting for 54% of the total costs at the stand-alone. For project components, overheads and service provision made up the majority of the costs. The mean cost per person tested at stand-alone (\$51) was higher than at the mobile (\$25). Linkage to care cost at the stand-alone (\$1039) was lower than the mobile (\$2102).

Conclusions: This study provides insight into the cost of an NGO led CB-HTS project providing HIV testing and linkage to care through two CB-HIV testing modalities. The study highlights; (1) the importance of including all applicable costs (including overheads) to ensure an accurate cost estimate that is representative of the full service implementation cost, (2) the direct link between test uptake and mean cost per person tested, and (3) the need for effective linkage to care strategies to increase linkage and thereby reduce the mean cost per person linked to HIV care.

INTRODUCTION

South Africa has a large burden of human immunodeficiency virus (HIV); approximately 6.4 million people are infected with HIV [1] and 3.1 million are on treatment (2014/15) [2]. The financing and sustainability of HIV services have become a priority [3]. In response to the HIV epidemic, South Africa has adopted the UNAIDS “90-90-90” target; by 2020, 90% of all people living with HIV should know their status, 90% of all eligible people with diagnosed HIV infection should receive sustained antiretroviral therapy (ART), and 90% of all people receiving ART should have viral load suppression [4]. In South Africa, it is estimated that, of those who are HIV-positive, only 52% of men and 65% of women, know their status [5]. HIV testing services (HTS) have a pivotal role to play in the pursuit of the first “90” by expanding the proportion of people living with HIV who know their status.

Taking HIV services closer to beneficiaries and communities to improve test uptake [6] is important. Community-based HIV testing services (CB-HTS) can reach populations who do not typically access health facilities, for example, males [7][8][9], making them a viable alternative to government-led facility-based services. Community-based services can provide HIV testing: (1) on a mobile basis (using mobile vans and tents) which can reach more men compared to facility-based services [10][11]; (2) at stand-alone facilities (fixed sites), which have proportionately more clients who test HIV-positive compared to mobile services [12]; and (3) in the home, which reaches more first-time testers and males compared to mobile services [13].

The current trend in sub-Saharan Africa is to outsource community-based services to non-governmental organizations (NGOs) [14], making it vital to understand the impact that NGO-led HIV testing services can have in reaching those unaware of their HIV status. While CB-HTS have been shown to be feasible [15] and acceptable [16], there is limited literature on the cost of implementing and maintaining NGO-led CB-HTS, or on what drives the cost of NGO-led services. This is important for future planning to ensure the sustainability of these services, especially within the context of declining donor funding [3] and the continuing need to scale up CB-HIV testing services.

As CB-HIV testing modalities may differ in their infrastructure (e.g. fixed site or mobile) and client characteristics (proportion of males, first-time testers, HIV-infected), it is important to estimate the cost of each modality. This study therefore explored the costs of implementing and providing services at two community-based NGO-led HIV testing modalities, stand-alone

and mobile, in Cape Town, South Africa. It also calculated the mean cost associated with key HIV outputs (HIV testing, diagnosis and linkage to HIV care) for each modality.

METHODS

Setting

This study took place in the Cape Metro district, Western Cape Province, South Africa. This district, home to 66% of the Province's population [17], has an antenatal HIV prevalence of 20.4% [18].

This study was embedded within a large community-based HIV testing services (HTS) project. The Desmond Tutu TB Center (DTTC) at Stellenbosch University worked in partnership with five non-governmental organizations (NGOs) in five peri-urban communities within the Cape Metro district. These communities were all characterized by poverty, overcrowding, high unemployment rates, and high HIV prevalence [19]. Each NGO worked in a separate community, where they each implemented two community-based HIV testing modalities: a stand-alone center and a mobile service. The analysis was conducted with data from one NGO.

Description of the CB-HTS project

Stellenbosch University awarded each NGO a contract to provide CB-HTS via a tender process, with successful NGOs demonstrating good financial and management capacity, as well as relevant experience working in high-HIV-burden communities around Cape Town. Stand-alone HTS centers were fixed sites in accessible locations that allowed clients to walk in without an appointment and request any of the services provided as part of a comprehensive "HTS service package". Mobile services consisting of "pop-up" tents and a caravan (mobile van) were set up in the community near transport hubs, on open fields, or next to main thoroughfares. These sites were selected on an ad hoc basis by the HTS team and changed regularly. Some sites were visited more than once if there was sufficient demand for services at a particular site. Services at the stand-alone and the mobile sites were the same and were delivered using standard operating procedures. Services included HIV testing, TB and STI symptomatic screening, TB testing, screening for non-communicable diseases, pregnancy testing, assessment of family-planning needs, general health education, and linkage to relevant care and treatment services. Clients who did not want an HIV test could still access any of the other services provided.

While NGOs were responsible for service implementation, DTTC was responsible for the overall management of the CB-HTS project, as well as ensuring contractual obligations to the funder, providing technical assistance to the NGOs (training, mentoring and funding), data management, and overall financial management. DTTC monitored NGO expenditure and progress toward targets on a quarterly basis through the timely submission of financial and narrative reports by each NGO.

For each NGO, the core staffing complement was identical and consisted of a coordinator, a professional nurse, an enrolled nurse, and three trained HIV lay counsellors. The day-to-day logistics, management, and monitoring and evaluation of services were the responsibility of the coordinator and the professional nurse. The enrolled nurse provided the majority of the clinical services under the supervision of the professional nurse [20], who provided clinical services when required. The HIV lay counsellors provided pre- and post-test counselling and HIV rapid testing. The nurses were employed by Stellenbosch University, but seconded to the NGO. The coordinator and HIV lay counsellors were employed directly by the NGO. Support personnel, based at DTTC and the NGO offices, were tasked with overseeing the management, operations, human resources and data aspects of the CB-HTS project. Support personnel were employed to perform a number of other duties at DTTC and the NGO unrelated to this project and hence gave a proportion of their time to this project. (See Additional File 1 for categories of core and support personnel – at the end of this chapter).

A bi-annual audit* (see description at the end of this chapter) monitored and evaluated a standardized quality service across all five stand-alone centers and mobile services, and also between services provided at stand-alone centers and on a mobile basis. This was to ensure that clients received an identical service irrespective of which HTS modality they accessed.

HIV testing services

After pre-test counselling, clients voluntarily consented to an HIV test. HIV testing was done in accordance with provincial algorithms and guidelines. Using a serial testing algorithm, an HIV diagnosis was made when both the screening (Advanced Quality HIV-1/2) and confirmatory (Abon HIV-1/2/0 Tri-line) rapid tests were positive. Discordant results were confirmed with a laboratory ELISA (Enzyme-Linked Immunosorbent Assay) test performed by the National Health Laboratory Service (NHLS). Clients received their HIV test result during post-test counselling. HIV-positive clients were given a referral letter to a public health facility for HIV care and treatment. In addition, they were followed up telephonically to

determine self-reported linkage to care. At least three attempts over a three-month period were made to contact the client to determine linkage to care. During the telephone interviews clients were asked a number of relevant questions such as: Where did you access HIV care? Who did you see? What were you told? When is your next appointment? If the individual could answer each question, and provide adequate detail, they were considered to have linked to care and were documented as such. If the client could not be reached telephonically after a number of attempts at various times of the day, then a home visit was done.

Selection of study site

We purposively selected one of the five communities in which the CB-HTS project was implemented. Across all five communities (1) socio-economic circumstances (peri-urban areas described above) were similar; (2) services were implemented with the same number of personnel and personnel categories; (3) remuneration was similar for same-category personnel; (4) identical services were provided within the same standard operating procedure framework; (5) personnel efficiency was similar, i.e., similar numbers of clients were provided with services and a similar number of quality assurance practices and monitoring and evaluation practices were completed; and (6) public primary health care facilities existed where HTS is offered, providing an alternative venue for accessing HTS for those living in these communities. The community selected for the study was chosen because of the long standing working relationship between DTTC and the NGO working in that community.

Cost data collection

As the NGO provided services, this study used a service provider perspective, considering the resources utilized and the HIV outputs achieved in the implementation of two CB-HIV testing modalities. We obtained quarterly project costs for the period July to September 2014. Assuming similar costs per quarter, these costs were then annualized by multiplying each quarterly cost by four. In addition, the annual financial expenditure report for this CB-HTS project was used to identify any additional costs, which were also listed. These included, for example, annual costs (insurance and occupational health cover) and ad hoc costs such as the printing and purchasing of Information, Education and Communication (IEC) materials. The instrument for collecting data was adapted from a costing tool developed by the International Training and Education Centre for Health (I-TECH) [21] [22] and developed in Microsoft Excel 2011. All costs were calculated in South African rands (ZAR) and then expressed in 2014 US dollars (exchange rate R11/\$1).

Costs were collected from three sources: (1) the NGO (costs incurred directly by the NGO with funds secured from DTTC including salaries, office furniture and medical consumables); (2) DTTC (costs incurred directly at DTTC such as support personnel salaries, computers used by support personnel, and printing); and (3) the Provincial Department of Health (HIV test kits and condoms were supplied free of charge to the project).

Measurement of costs

The economic costs of implementing two CB-HTS modalities were calculated using an ingredients approach. All inputs were identified, measured, and allocated.

Overview of allocation of costs

Firstly, costs were divided into three broad categories: personnel (divided into core and support personnel), capital goods, and recurring goods and services. Secondly, we considered how each of these broad cost categories contributed to seven project components: (1) administration, (2) capacity-building (training/coaching/mentoring), (3) monitoring and evaluation, (4) data, (5) planning, (6) direct service provision, and (7) overheads.

To compare cost per modalities, we allocated shared costs across the mobile and stand-alone modalities. We used client volumes and personnel time as the allocation base. As some costs were driven by personnel share and other costs were driven by client volumes, we used both allocation bases. Costs such as salaries, security, and occupational health care are associated with personnel and were allocated based on the share of personnel time devoted to each modality. Costs such as HIV rapid test kits, IEC materials, and medical waste disposal are closely associated with client volumes and were allocated using the modalities' client volume share. (See Additional File 2 for examples of costs included in each project component per cost category, per testing service – at the end of the chapter).

Cost categories

Core personnel costs: All core personnel (n=6) in the study site consented to keep activity sheets for the period July to September 2014. These activity sheets recorded their time spent per project component at either the stand-alone center or the mobile service. They recorded their activities at 30-minute intervals throughout the day, using pre-determined coding. A data clerk entered the data from the activity sheets into a Microsoft ACCESS 2013 database which was developed specifically for this study. Where time slots were blank, this was coded as such in the database. The database was used to determine the proportion of time spent per project

component within each HTS modality for each core personnel individual. Personnel remuneration was received from the human resources department and from NGO salary advices. Summaries of personnel time, together with their salary costs, were imported into the Excel spreadsheet.

Support personnel costs: All identified support personnel (n=10) provided written informed consent to be interviewed. The interviews were conducted between March and September 2015 and followed a pre-determined template. Support personnel identified each activity that they performed within the CB-HTS project. The costs for each support person were entered into the Excel spreadsheet as overheads, proportionately allocated across the two HTS modalities.

Capital goods: The equipment inventories at the NGO and DTTC were used to compile a list of capital goods. For each item the year of purchase, unit price, quantity, and the useful life years were captured. It was noted that six kinds of items made up 80% of the total cost of capital items (one mobile van, one laptop, three large tents, two small tents, two point-of-care CD4 analyzers, and a proportion of the database server). Assuming depreciation remained constant each year, and using an interest rate of 8% [23], the equivalent annual cost for each of these six items was calculated and converted to 2014 prices using the South African consumer price index (CPI) rate [24] for the year in which the item was purchased. The 20% remaining balance of smaller capital item costs was calculated based on the presumption that these items had the same structure. For these items we used an average CPI rate. The cost of the capital items was then apportioned across the HTS modalities and across the project components within each modality.

Recurring goods/services: The cost data for all recurring goods/services was gained from invoices paid, either by DTTC or by the NGO. We used the NGO financial quarterly report (July to September 2014) for cross-checking, to ensure all recurring goods/services were included as well as the overall CB-HTS project financial expenditure report to ensure that costs incurred annually, e.g., mobile van licensing and servicing, were included. The Provincial Department of Health provided costs for HIV test kits and condoms, which were included in the study although they were provided free of charge to the project. The costs were allocated appropriately between the seven project components and across the two HTS modalities.

HIV outputs

The HIV outputs measured in this study included (1) the number of people who received pre-test counselling (which includes a package of related services described above), (2) the number of people who consented to and had a screening HIV rapid test, (3) the number of people who were diagnosed as HIV positive (according to the HIV testing algorithm), (4) the number of HIV-infected people referred for HIV care, and (5) the number of people who self-reported that they had linked to HIV care. These outputs were measured for those who attended HTS at the stand-alone center and the mobile services between January and December 2014. We assessed a longer time series of data to confirm that the period July to September was not an outlier, but provided a representative picture of HIV outputs for this NGO.

Data analysis

We calculated the total cost of each HTS modality and the cost categories (personnel, capital, and recurring goods/services) across each HTS modality. Costs per project component were calculated to examine cost drivers overall and per HTS modality. HIV outputs were analyzed and then the mean cost for each HIV output was calculated per CB-HIV testing modality based on total cost of the modality divided by the specific HIV output. (For example, the mean cost per person tested at stand-alone = total cost of stand-alone service modality/total number of people tested at stand-alone.)

Ethics approval

The study was approved by the Health Research Ethics Committee of Stellenbosch University (S12/02/059). A memorandum of understanding exists between Stellenbosch University, the Cape Town City Health Directorate and the Provincial Department of Health regarding the implementation of CB-HTS. All personnel (employed by Stellenbosch University and the NGO) who either completed a time allocation sheet or who were interviewed, provided written informed consent. The NGO also provided written informed consent to use its quarterly financial report. No incentives were given to any study participant or client who tested for HIV.

RESULTS

Overall costs per cost category

The overall annual cost of the CB-HTS delivered by the NGO selected for this analysis was \$174 380, with stand-alone costing \$96 616 and mobile services \$77 764. Of the three cost categories, personnel costs accounted for 50% of the total costs (Table 1). For the stand-alone modality, personnel costs accounted for the highest proportion of costs (54%). Within the

mobile modality, the proportion of costs spent on personnel and recurring goods/services costs were both 46%. Capital costs were higher for the mobile modality than for the stand-alone.

Table 1: Overall costs per cost category per CB-HTS modality

	Stand-alone	% of stand-alone cost	Mobile	% of mobile cost	TOTAL	% of total cost
Personnel	\$51 715	54%	\$35 166	46%	\$86 881	50%
Capital goods	\$4 358	5%	\$6 740	8%	\$11 098	6%
Recurring goods/services	\$40 543	41%	\$35 858	46%	\$76 401	44%
TOTAL	\$96 616		\$77 764		\$174 380	

Costs per project component

Overall, overheads and service provision accounted for the majority of the expenditure (37% and 36% respectively). Capacity-building made up 11% of the total costs, while administration, monitoring and evaluation, data, and planning each made up less than 7% of the total costs. As seen in Figure 1, at the stand-alone modality, overheads were the main cost driver, accounting for 41% of the overall cost. Within the mobile modality, service provision accounted for a higher proportion of the expenditure (43%) than overheads (33%).

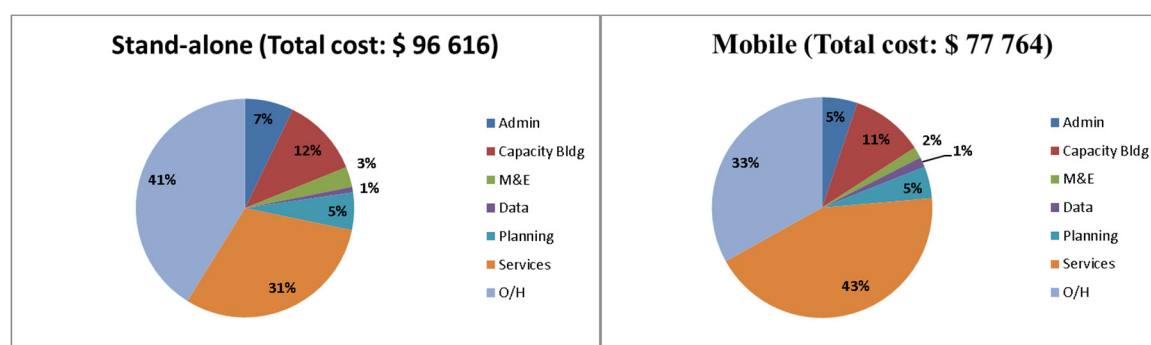


Figure 1: The proportion of costs per program component per CB-HIV testing modality

Overheads accounted for 27% of costs within the personnel category (which included salaries of support personnel) and more than half (55%) of costs within the recurring goods/services category (which included rental, utilities, telephone, cleaning, security, and NGO administrative costs (not shown)). Figure 2 shows that overhead costs in both the personnel and recurring goods/services categories at the stand-alone center were higher than at the mobile.

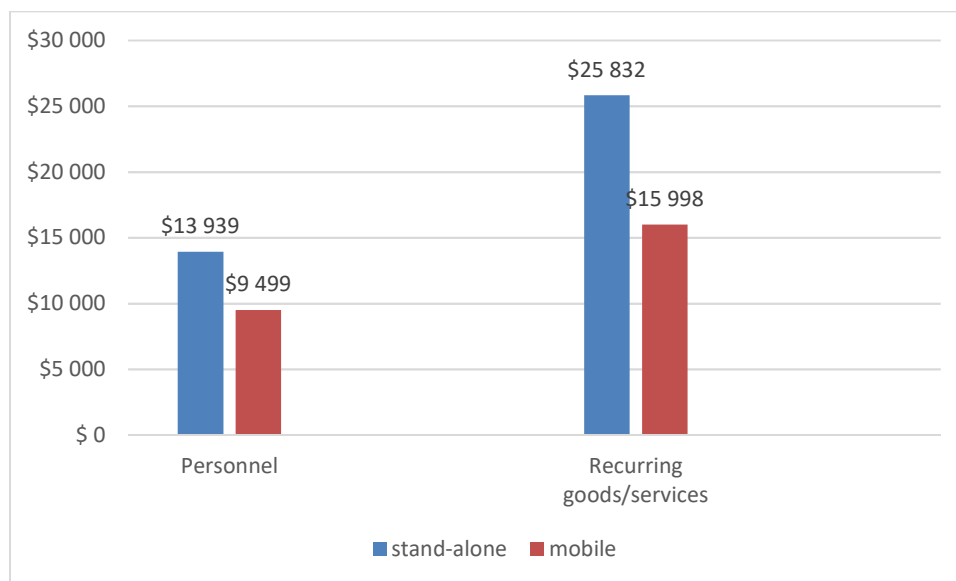


Figure 2: Overhead costs per cost category per modality

HIV outputs and costs

Overall, 5031 clients accessed the NGO-led CB-HTS in the study site between January and December 2014, and 3104 (61%) accessed the mobile modality. The median age of individuals was 24 years (IQR: 17-33). A lower proportion of males (26%) utilized the stand-alone modality than the mobile modality (55%). As shown in Table 2, the majority of clients consented to an HIV test (98%) irrespective of which modality they accessed. Of those who tested for HIV, a higher proportion were diagnosed HIV-positive at the stand-alone centers (6%) than at the mobile services (2%). Self-reported linkage to care was higher for those who accessed stand-alone centers (74%) than at mobile services (50%).

Table 2: HIV outputs and cost per HIV output per CB-HIV testing modality

HIV Outputs	TOTAL	Stand-alone \$ 96 616		Mobile \$ 77 764	
		Number	Cost per person	Number	Cost per person
Counselled	5 031	1927	\$50	3 104	\$25
Tested (%)	4 966 (98)	1 909 (99)	\$51	3 057 (98)	\$25
HIV diagnosed (%)	202 (4)	128 (6)	\$755	74 (2)	\$1 051
HIV referred (%)	198 (98)	125 (97)	\$773	73 (98)	\$1 065
Linked to HIV care (%)	130 (65)	93 (74)	\$1 039	37 (50)	\$2 102

The overall mean cost per person counseled and tested at stand-alone centers (\$51) was higher than at the mobile modality (\$25). At the stand-alone, the mean cost of diagnosing a person

with HIV (\$755) and of successfully linking an HIV-infected person to HIV care (\$1039) was lower than at the mobile. See Table 2.

DISCUSSION

This study provides insight into the cost for an NGO-led CB-HTS, providing HIV testing and linkage to care through two modalities. Overall, the stand-alone modality cost more than the mobile modality. Personnel costs accounted for half of the total cost overall and 54% of the cost of the stand-alone modality. These findings are consistent with other studies which found personnel costs to be a cost driver [15][25][26]. Labor costs are high in African countries (including South Africa) compared to similar economies in Asia [27]. This highlights the need for good management of personnel and their activities. Continually improving managerial skills is critical, as these skills may be lacking in the health sector, where clinically trained personnel typically become managers.

Costs for capital goods and recurring goods/services as a proportion of the total spent at each HIV testing modality were higher for the mobile modality than the stand-alone. This was predominantly due to the mobile van and tents that were used exclusively for mobile services and the higher number of medical goods/services required at mobile services due to the greater numbers of people accessing the mobile modality.

Of interest is that costs associated with service provision represented less than half the total costs at both modalities. This was predominantly due to the high overhead costs that can be associated with the manner in which this project was implemented (cost of managing the project at DTTC and the NGO). The overhead costs were comprehensive and directly associated with ensuring quality within the project. Reducing these overheads would have resulted in lower levels of management (general and data) together with fewer monitoring and evaluation systems and continual training and coaching. All of these aspects are important for quality service provision. Future work is required to understand the relationship between quality of services and overheads in more detail.

Fewer individuals accessing counseling and testing at the stand-alone modality resulted in a higher cost per person counseled and tested at the stand-alone modality (\$51) compared to the mobile modality (\$25). This cost comparison is similar to that reported in previous publications [6][28]. Compared to the mean cost per person tested in other studies, our findings show a similar cost for the mobile modality [15] [11], but a higher cost at the stand-alone modality

[28] [29] [30]. Future studies can look at ways of improving personnel efficiency and increasing test uptake. Based on the analysis here it is likely that higher client volumes and diverting more HIV testing paperwork to administrative personnel could reduce the mean cost per person counseled and tested.

Mobile services achieved lower costs per person tested, making mobile services an important strategy to consider when working toward achieving the first “90”. However, the benefits of increased testing uptake need to be balanced against the yield of HIV-positive cases. The mobile modality had a lower proportion of individuals who were diagnosed with HIV and who reported successful linkage to care than the stand-alone modality. These lower yields resulted in the cost per person diagnosed and successfully linked to HIV care being higher at the mobile modality than at the stand-alone modality. Future studies should look at evidence-based interventions to improve linkage to care, especially from mobile services. It is also important to highlight that HIV testing services can link HIV-negative individuals to HIV prevention interventions, for example voluntary male medical circumcision (VMMC) or pre-exposure prophylaxis (PrEP). This may improve cost efficiency at HIV testing services and should be further investigated.

Our results showed that the mobile modality was utilized by a greater proportion of males than the stand-alone, which is important given that this is a subpopulation that has been more difficult to reach. The cost of a CB-HTS modality should be considered together with the ability of that modality to reach certain ‘hard to reach’ populations e.g. males. This is specifically true for the mobile modality. Future studies can consider costing around reaching a range of subpopulations that have been shown to be difficult to reach through traditional HIV testing avenues.

The costs of diagnosing and linking individuals to care within this project were much higher than has previously been reported for South Africa [6] and in Swaziland [15]. The current HIV environment within South Africa (general decline in HIV incidence) [1] may have contributed to higher costs in finding HIV-infected individuals. Many published studies used data obtained prior to 2010 when fewer South Africans had tested for HIV. Since the launch of the National HTS campaign in 2010, 35 million South Africans have tested [2]. With more people aware of their HIV status, targeted approaches are now required to achieve the first “90” in the most cost-effective manner. Future costing studies will need to determine the costs of CB-HTS strategies that are implemented in different ways, while ensuring a comprehensive accounting

of overhead costs, to accurately define the cost of finding and diagnosing individuals with unknown HIV.

Different factors should be considered when comparing the costs of this project with those of other HIV testing services in South Africa. Firstly, the nature of the NGO-led project resulted in the inclusion of a number of costs that were unique to this project. The retail space rented specifically for this project meant that it was allocated 100% of the full rental and associated costs (telephone, utilities, insurance, security etc.). The core personnel, employed specifically for this project, did not provide services outside of this CB-HTS project. In government health facilities, overhead costs, for example building, space and security costs are typically apportioned across a number of health services provided from that one health facility [31]. Shared resources and economies of scale reduce individual project costs [32]. In this NGO-led project, the specific clinical activities resulted in lower utilization of personnel compared to a government health facility scenario, where the range of services is broader and personnel work across services. This reflection provides some understanding of the kinds of costs that drive expenditure for an NGO-led CB-HTS project. Secondly, the South African rand (ZAR) has weakened considerably against the US dollar since 2004. As costs are collected in ZAR and expressed in USD, exchange rate fluctuations, together with an undervalued South African rand [33], should be considered when comparing the expenditure of this project to other South African CB-HTS.

A major strength of this study is that it provides a thorough example of the costs of testing for HIV within an NGO-led project providing CB-HTS across two HTS modalities within a constrained health care setting. The first author had access to all costs, resulting in a realistic assessment of the costs involved in implementing CB-HTS for the stand-alone and mobile modalities. This is in contrast to other costing studies, where retrospective data collection may have been subject to recall bias [34] or poor record-keeping [25]. The data collection process was intensive and detailed, allowing for an in-depth and realistic understanding of the proportion of core personnel time across project components. A further strength is that this study includes more recent cost data than existing published studies.

As this study was conducted from a service provider (NGO) perspective, we acknowledge the exclusion of patient costs, (typically costs associated with travel and waiting time), as a limitation. However, we do not believe that patient costs would have been different for mobile and stand-alone modalities, based on prior (unpublished) work by the first author. A second

limitation is that we only included the costs from one site, but as all sites had similar characteristics, this limitation is unlikely to be substantial. Thirdly, the study did not differentiate between the costs of counseling and testing those who had a positive HIV test result and those who had a negative result. In addition, linkage to care was self-reported, as we were not able to check self-reported linkage to care against health facility records. We acknowledge that there may be over-reporting. However, linkage to care from the mobile service was similar to that found in another Cape Town study [35]. Generalizability of the results is also acknowledged as a limitation. The study was conducted within a peri-urban area around Cape Town and caution should be exercised when generalizing to other parts of South Africa or other African countries, even where HIV prevalence and incidence is similar. However, the study does provide a unique example of a costing analysis for two CB-HIV testing modalities in a peri-urban setting and thereby contributes to the general body of literature.

CONCLUSION

The response to the South African HIV epidemic is largely funded by the government [6]. Contracting NGOs to deliver quality HIV testing services is one solution to the limited government resources available. This study provides insight into the cost of an NGO-led community-based HTS project. It fills a gap in the literature by utilizing detailed and recent cost data to determine the costs of implementing two community-based NGO-led HIV testing modalities (stand-alone and mobile) and the costs associated with realizing key HIV outputs for these two HIV testing modalities in a peri-urban setting. The findings show that due to the higher numbers of people who accessed mobile services, the mean cost per person counseled and tested for HIV was much lower for the mobile modality than for the stand-alone modality. However, due to the lower HIV yield at the mobile services, the cost per person diagnosed and linked to HIV care was lower at the stand-alone modality. Overall, this study highlights (1) the importance of including all applicable costs (including overheads) to ensure an accurate cost estimate that is representative of the full service implementation cost, (2) the direct link between test uptake and mean cost per person tested, and (3) the need for effective linkage to care strategies to increase linkage and thereby reduce the mean cost per person linked to HIV care.

FOOTNOTE

*The bi-annual audit evaluated client folders randomly sampled from the stand-alone center and the mobile modality. The audit included a review of client folders to check that all the

major aspects of the HIV testing service had been completed and recorded correctly. This included checking; that the client records contained all the necessary demographic and health data, if there was a record of a risk reduction discussion, if family planning needs were assessed and an action noted around the needs, if TB screening was done, if consent for an HIV test was taken, if condoms were offered, if there is a record of referral to an HIV service, evidence that the client had accessed public health services for HIV care and treatment etc. Any gaps in service provision were identified and training with the relevant personnel was implemented to close these gaps, to ultimately ensure that a standardized service was provided across NGOs.

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Additional File 1: Categories of core and support personnel involved in the CB-HTS project

Core Personnel category	Total employed for CB-HTS project	Total employed at study site (n=6)	Employed by	Effort
NGO coordinator	5	1	NGO	50%
HIV counsellors	15	3	NGO	100%
Professional nurse	5	1	SU (seconded to NGO)	100%
Enrolled nurse	5	1	SU (seconded to NGO)	100%
Data Clerks	2	N/A	SU	100%

Support Personnel category	Total personnel providing support (n=10)	Employed by	Effort
Management	3	SU	4%, 50% and 80%
Administration	1	SU	100%
Human resources	2	SU	Both 10%
Data	2	SU	25% and 20%
Driver	1	SU	100%
NGO administrator	5	NGO	20%

Additional File 2: Examples of costs included in each project component per cost category, per testing service

Cost categories	HCT Modalities	CB-HCT project components						
		Admin	Capacity Building	Monitoring & Evaluation	Data	Planning	Direct Services	Overheads
(1) Personnel	Stand-alone	Proportion of core personnel costs	Proportion of core personnel costs	Proportion of core personnel costs	Proportion of core personnel costs	Proportion of core personnel costs	Proportion of core personnel costs	Proportion of support personnel costs
	mobile	Proportion of core personnel costs	Proportion of core personnel costs	Proportion of core personnel costs	Proportion of core personnel costs	Proportion of core personnel costs	Proportion of core personnel costs	Proportion of support personnel costs
(2) Capital Items	Stand-alone	Proportion of a laptop, desktops, printers, office furniture	Proportion of a laptop, desktops, printers, office furniture	Proportion of a laptop, desktops, printers, office furniture	Proportion of a database server, laptop, desktops, printers	Proportion of a laptop, desktops, printers, office furniture	Point of care CD4 analyzer, glucometer, scale, blood pressure equipment, proportion of office furniture	None
	mobile	Proportion of a laptop, desktops, printers, office furniture	Proportion of a laptop, desktops, printers, office furniture	Proportion of a laptop, desktops, printers, office furniture	Proportion of a database server, laptop, desktops, printers	Proportion of a laptop, desktops, printers, office furniture	Mobile van, tents, point of care CD4 analyzer, glucometer, scale, blood pressure equipment, folding tables, plastic chairs	None
(3) Recurring goods/services	Stand-alone	Proportion of stationery and printing	Proportion of stationery and printing	Proportion of stationery and printing	None	Proportion of stationery and printing	Waste disposal, medical supplies, laboratory costs, HIV rapids test kits, condoms, printing	Proportion of rent, utilities, IT support, telephone, cleaning & sanitary services, NGO admin costs, general maintenance, occupational health insurance, vehicle running costs (support personnel)
	mobile	Proportion of stationery and printing	Proportion of stationery and printing	None	None	Proportion of stationery and printing	Waste disposal, medical supplies, laboratory costs, HIV rapids test kits, condoms, printing, travel (towing caravan), caravan servicing/licensing	Proportion of rent, utilities, IT support, telephone, cleaning & sanitary services, NGO admin costs, general maintenance, occupational health insurance, vehicle running costs (support personnel)

CHAPTER 8: DISCUSSION

The studies included in this dissertation span eight years (2008 to 2015) – see the timeline in Chapter 1, page 6. This was a critical period in South Africa's response to the HIV epidemic. Improved political commitment after 2008 resulted in a more coordinated and dynamic response. A drive to increase the number of South Africans who knew their HIV status, resulted in the national HIV testing campaign and 7.6 million individuals testing for the first time (1). A drive to scale up testing services, resulted in task shifting and trained HIV lay counselors were able to do HIV rapid testing (2). Treatment guidelines kept changing to increase eligibility criteria for antiretrovirals (ARVs). The HIV climate changed from an emergency to a sustainable response, with a scaling up of a core of evidence-based interventions (3), of which HIV testing services is one.

Access to HIV testing services (HTS) is much more than the mere presence of the service (4). Merely offering HTS will not necessarily result in utilization of the services. Using the access framework (described in Chapter 1), this chapter summarises the main findings from the studies included in this dissertation to discuss the availability, affordability and acceptability of non-governmental organization (NGO) -led mobile and NGO-led stand-alone services from a user perspective. The chapter then discusses the importance of service providers understanding the health-seeking behavior of users as well as the role that NGOs can play in service provision. The discussion then moves to considerations for scale up of the CB-HCT initiative.

After highlighting the strengths and limitations of this dissertation overall, practical considerations for strengthening HTS are discussed, followed by an overview of what this dissertation contributes overall to the scientific knowledge base. Implications for future research are noted throughout.

8.1 DESCRIBING THE USERS IN OUR SETTING

This section describes the socio-economic status and demographics of the users who accessed the community-based HIV counseling and testing (CB-HCT) initiative (mobile and stand-alone services) and the public health facilities in our setting. While this is discussed separately from the dimensions of access: availability, affordability and acceptability, it is acknowledged that socio-economic status and demographics cut across the three.

Socio-economic status did not differ between users who accessed mobile services and public health facilities (Chapter 2). The majority of users were single, had not completed schooling; were informally employed or unemployed; did not receive a social grant; and, used electricity as their main fuel source. Approximately 50% lived in informal housing. The only difference found was that users who accessed mobile services were less likely to report they had piped drinking water in their own yard compared to those who accessed public health facilities. These findings are in line with other data that describe the lower socio-economic status of the populations who live in the communities where the CB-HCT initiative was implemented (5).

As the CB-HCT initiative provided HIV-testing in the same communities where public health facilities already existed the similar socio-economic status between groups was expected. Individuals from these communities could have accessed an HIV test either at a mobile, stand-alone or at a public health facility. Similar socio-economic status allows for a comparison of availability, affordability and acceptability from a user perspective across these service options, which is a strength of this work.

The sex and age of users differed between mobile, stand-alone and public health HTS. One of the key findings is that consistently across the studies where data on sex exist, there was a higher proportion of males amongst the users at mobile compared to stand-alone and public health facilities. The proportion of males who accessed mobile ranged between 40% and 55% (Chapters 2, 4, 7). The proportion of males who accessed stand-alone (25% to 26%) was similar to the proportion who accessed public health facilities (26% to 27%). These findings are consistent with other South African studies that found a higher proportion of males test at mobile services compared to stand-alone services (6) and public health facilities (7). HIV testing uptake remains low for men (8), who are underrepresented in public health facilities (9). There is a need to target men with alternative testing services. These findings indicate that men may be attracted to mobile services. In turn, this may infer that the availability, affordability and acceptability that a mobile service offers meets the health-seeking behavior of men. This highlights the association between user demographics and access, and demonstrates that access is about the interaction between the health system and the user.

The majority (66%) of first-time testers at mobile and stand-alone (Chapter 5) were male. This confirms previous studies that show first-time testers are more likely to be male (10)(11) and disputes studies that reported first-time testers are more likely to be female (1). A higher proportion of males are currently undiagnosed (12), indicating the need to target males who

have never tested previously. Using mobile testing services may be one way to reach these male first-time testers.

Age of users at the mobile, stand-alone, and public health facilities differed across studies. In Chapter 2, the proportion of users in the age categories: 31-50 years and ≥ 50 years were more likely to access mobile than public health facilities. In Chapter 4, more than a third of users at mobile and stand-alone were within the age category; 18-24 years. This indicates that both older (≥ 30 years) and younger (≤ 25 years) users accessed mobile services. Chapter 4 shows that the median age of participants at mobile and stand-alone was 28 years (IQR: 23-37) and 27 years (IQR: 23-36) respectively. The median age of users at the public health facility was 30 years (IQR: 23-34), with almost half of the users within the age category: 30-39 years. In Chapter 2, 41% of users at public health facilities were in the age category: 18-25 years. This indicates that users at public health facilities were both older (≥ 30 years) and younger (≤ 25 years). Although age differed across studies, this dissertation indicates that overall mobile services were more likely to reach older age groups. Published studies report similar results in urban areas; older age groups access mobile compared to stand-alone (6) (13) and public health facilities (7)(6). In rural areas, mobile can reach younger people (11).

First-time testers at mobile and stand-alone had a median age of 24 years (Chapter 5), with males younger than females (24 and 27 years respectively). This finding is in line with another study that found mobile to be successful in reaching first-time testers who were more likely to be younger (11). The median age of those who linked to care at the stand-alone and mobile was 30 years and 31 years respectively (Chapter 6). This is similar to another Cape town study that reported that the median age of users linking to care was 34 years (14).

These findings are important to bear in mind, as the discussion turns to availability, affordability and acceptability.

8.2 AVAILABILITY

This dimension is concerned with the provision of HTS in the right places at the right times for the populations who seek an HIV test (15). Availability is determined by: (i) geographical accessibility, i.e. physical proximity of HTS to the potential user; (ii) the 'degree of fit' between when HTS are provided and the times that individuals require the services; and, (iii) the types and range of services offered, i.e. are comprehensive services offered or are individuals referred to other facilities for certain services (16).

The CB-HCT initiative offered HTS from two modalities; stand-alone centers and mobile services in eight communities within the Cape Metro district of the Western Cape Province of South Africa. While the location of the service and infrastructure differed between these two modalities (fixed site in one location vs. mobile van and tents set up at different locations), everything else was consistent (including: the range/type of services offered; staffing levels; the HIV testing process and algorithms; quality assurance; and, monitoring and evaluation). The Department of Health offered HTS at multiple public health facilities in the same eight communities. Essentially, a potential user could decide to have an HIV test at either a mobile, stand-alone or public health facility. This section explores the availability of these three modalities.

8.2.1 Geographical accessibility

There was no difference between mobile, stand-alone and public health facilities regarding how users travelled to the services. A second key finding is that consistently across the studies, most participants walked to HTS (Chapters 2, 3, 4); either walking past the mobile while on their way elsewhere (Chapters 2, 3, 4) or they lived or worked in close proximity to the stand-alone center (Chapter 4) or public health care facility (Chapter 2) and therefore walked to the HTS. This may be due to the peri-urban setting, where a number of public health facilities as well as community-based services existed in each community. Geographical accessibility was reported as a reason for choosing a particular service provider (Chapter 3) with participants reporting that they had chosen an HTS that was within walking distance. These findings show that individuals will utilize an HTS that is within close proximity (walking distance), irrespective of modality.

First-time testers reported not having tested for HIV previously because it was too far to travel to an HTS (Chapter 5). This concurs with studies that show long travel distances and travel times are barriers to uptake of health services (17)(18), specifically in rural areas (19). Proximity of testing service to the user is directly related to travel time. There was no difference in travel time reported by users (<30 minutes), irrespective of whether they accessed a mobile, a stand-alone or a public health facility (Chapters 2 and 4).

Mobile services were offered along busy thoroughfares and at transport hubs, where many people walked past or congregated. This made mobile not only accessible to those walking past, but also provided an immediate opportunity to test for HIV, another key finding. *“I was parked at the taxi terminus waiting for my taxi to fill up. I could just walk over to them [the*

tents]), *it was very convenient to me*” (Male, 38 years). This immediate opportunity to test (Chapters 2 and 3) is unique to mobile especially for those who were typically not thinking about health issues and would not have otherwise have tested for HIV at that time. “*On the way we saw the tents on the side of the road with a sign that says HCT*” (Female, 19 years). These findings concur with studies that show that mobile services are conveniently accessible, which improves test uptake (11) (20).

More than a third (35%) of first-time testers, who tested at a mobile or stand-alone service, reported opportunity to test, as a reason for them having their first HIV test (Chapter 5). Many (40%) of first-time testers reported that they tested because they wanted to know their status. This highlights the importance of creating an opportunity to test, especially for those who have never tested before (e.g. men) and want to learn their HIV status. Providing an immediate opportunity to test for those who do not actively seek out an HIV test is one strategy for increasing access to HTS. The mobile was able to do this well because of its portable infrastructure and ability to move to where individuals congregated.

8.2.2 Opening hours

Participants were satisfied with the opening hours of HTS, irrespective of whether they had tested at mobile, stand-alone or a public health facility (Chapter 4). Public health facilities provided HTS during standard business hours. While mobile and stand-alone services were usually provided during standard business hours, mobile sometimes provided HTS over weekends and public holidays. While opening hours did not negatively affect availability of HTS for the cohorts who utilized HTS, a few first-time testers, predominantly men, reported opening hours as a reason for them not having tested previously (Chapter 5). This may be one reason for the low proportion of men (32%) who accessed HTS at public health facilities in Cape Town between 2010 and 2012 (routine city data). While this dissertation does not show a dissatisfaction with opening hours for HTS, it is acknowledged that we only include those who accessed HTS in our studies. Opening hours may have been a barrier for those who did not test and were not included in our studies. Opening hours are documented in the literature as a barrier to uptake of services for adolescents at school (21) and those at work (22). Mobile services can potentially overcome this barrier for employed individuals, by providing workplace HTS and for schoolchildren, by providing HTS at schools. There is a need for service providers to consider hours of operation when aiming to expand access to HTS and to provide services after hours and over weekends (23). More studies are needed to determine if

different populations will utilize HTS provided outside of standard business hours. Some evidence shows that men are more likely to utilize HTS after hours or on weekends (14).

8.2.3 Range of services

In addition to considerations around where and when HTS is provided, range and types of services are also important considerations for determining availability. Mobile and stand-alone provided HIV testing as part of an integrated service including TB screening and testing; sexually transmitted infection (STI) screening; sexual and reproductive health services; screening for non-communicable diseases; referral and linkage to care; and, treatment services at public health facilities. Offering a range of services related to HIV testing is important as other services appear to attract individuals and this creates the opportunity for healthcare providers to offer these individuals an HIV test (Chapter 3). At mobile it was reported, “...*they asked if I would like to come for a TB test ... when I got to the tent they told me about the HCT service and offered it to me*” (Male, 60 years). In public health facilities, “*I got tested when I went for my (family planning) injection*” (Female, 36 years). If HIV testing is available as part of an integrated clinical service, it provides an accessible opportunity for people to test for HIV while they are accessing other related services.

This dissertation only includes individuals who accessed a testing service. Individuals who have never tested before may have a different perspective on the role that the range of services plays in test uptake. Although there is a call for the provision of broader services (24), there are no published data on how the range of services offered by a service provider impacts on availability of HTS, thus providing an avenue for future research.

Offering HIV testing as part of routine screening for chronic disease may go some distance to ‘normalizing’ HIV testing (25) and reducing HIV-related stigma that has been documented as a barrier to HIV testing (26). This, in turn, may positively influence access to HTS. This also provides an opportunity for future research.

Referral and linkage to care is part of HTS. The mobile and stand-alone services linked HIV-infected individuals to HIV care and treatment services at public health facilities. Self-reported linkage to care was 63% overall for the mobile and stand-alone services. This is higher than what has been reported in other South African studies that reported linkage to care from self-initiated HTS (27)(14) and from provider-initiated HTS (27)(28). However, studies differ in their definition of linkage to care, making it difficult to compare across studies. Users

diagnosed with HIV at the stand-alone service were significantly more likely to link to care compared to those diagnosed at mobile services (Chapter 6), indicating that HTS is associated with linkage to care. This finding disputes a previous study that found no association between community-based testing services and linkage to care (29). Our finding implies that health-seeking behavior may play a role in linkage to care. Based on the findings above (geographical accessibility), users took advantage of the immediate opportunity to test that the mobile service provided. We hypothesize that users were not driven to test for HIV because of a lack of awareness of signs or symptoms of disease and this may have delayed them linking to care as well. This hypothesis needs to be tested.

Access is dependent on more than availability of services. The discussion now moves to affordability, the second dimension within the framework.

8.3 AFFORDABILITY

Affordability is described as the ‘degree of fit’ between the full costs to an individual to use the service and the individual’s ability to pay (16). Full costs include the cost of the HIV test; other direct costs (for example, transport costs); and, indirect costs (for example, loss of income or productivity while travelling to and from the service provider). The individual’s ability to pay relates to their ability to secure household funds to cover the direct and indirect costs (16). This section will explore the direct and indirect costs to the user, but does not provide any information regarding the users’ ability to pay. This is acknowledged as a limitation in being able to determine affordability in terms of the framework definition.

8.3.1 Direct costs

HIV testing is provided free of charge at all public health facilities. The CB-HCT initiative also provided HTS free of charge at mobile and stand-alone. The direct user costs discussed here are therefore the costs associated with getting to the HTS and not the cost of the service itself. The majority of participants reported that they did not incur travel costs. This is most likely because the majority walked to the HTS. This was consistent across studies, irrespective of whether participants accessed mobile, stand-alone or a public health facility (Chapters 2, 4). These findings highlight a link between availability and affordability: HTS provided in close proximity to potential users, means that users will potentially walk and not incur transport costs. Most of those who did not walk used public transport; taxi or bus (Chapter 4). The reliance on public transport is consistent with the socio-economic status of users in these

communities. When individuals have to travel further to access an HIV test, they incur the double burden of travel costs and travel time.

Users, who reported paying travel costs, reported paying < \$2 (Chapter 2). We did not collect data on household income but, based on the socio-economic status of the populations living in these communities, one would expect very little money available in households for non-essential expenditure. Because we found no difference in terms of socio-economic status between users at mobile, stand-alone and public health facilities, potentially there is a similar ability to pay among the populations included in these studies. Future studies that assess affordability of HTS should include the user's ability to secure household funds and explore user ability to pay.

8.3.2 Indirect costs

The majority of users reported that they did not incur any indirect costs when accessing an HIV test. Between 80% and 91% at the mobile, 75% of users at the stand-alone and between 65% and 85% at public health facilities, reportedly incurred no 'out of pocket' cost for accessing HTS (Chapters 2 and 4). There were no significant differences in affordability for users between modalities.

Having an HIV test appears to be affordable in our setting from the user perspective. This differs from studies that show transport costs are a huge burden (30). Many studies look at travel cost, whereby the patient is required to travel regularly to the health service for treatment (e.g. TB or HIV treatment). Very little data exist on the travel cost to get an HIV test, even though cost is a known barrier to HIV test uptake (31)(32). Indirect user costs are generally ignored in the literature and more work is required to determine the impact of indirect costs on affordability of HTS. For example, those who need to travel long distances may incur childcare costs or loss of income during the time it takes to access an HIV test. This may be more applicable in rural settings compared to our setting, but needs further investigation. Of note is that this dissertation only includes those who accessed an HTS. Direct and/or indirect costs may be prohibitive for those who have never tested for HIV. Future studies could also explore this.

The discussion now moves to acceptability, the third dimension within the framework.

8.4 ACCEPTABILITY

Acceptability refers to the nature of the service provided and how this is perceived by individuals and communities (16). It is the degree of fit between what individuals find to be acceptable or not, based on their cultural sensitivities. From a user perspective, expectations that influence acceptability of service provision are: healthcare providers should be respectful, listen to them, provide them with all relevant information, and provide an efficient service that includes privacy and avoids stigmatization (15). From a service provider perspective, expectations are that users are respectful toward the professional status of the healthcare providers and comply with their prescribed treatment (15). The studies included in this dissertation will present information around acceptability from a user perspective.

8.4.1 Overall satisfaction

The majority of users, irrespective of HIV testing modality accessed, reported to be very satisfied with their overall HIV testing experience. There was no significant difference in satisfaction scores for users at mobile compared to stand-alone, but users at mobile and stand-alone were significantly more satisfied compared to users who accessed public health facilities (Chapter 4). While user experiences were largely positive at public health facilities, issues reported included long waiting times and poor staff attitude (Chapter 3).

Satisfaction was measured on non-clinical aspects of HTS: opening times, cleanliness, waiting times, health information, privacy, staff attitude, result explanation, time taken for HTS and confidentiality. Satisfaction is a measure of whether the users' needs have been fulfilled by the health system (33)(34) and is therefore a useful measure for acceptability. Satisfaction with a health system has been linked to user experience (35). It is important to keep in mind that satisfaction is a subjective concept and self-reported perceptions are often driven by previous experience (15).

8.4.2 Waiting times

The largest difference pertaining to user acceptability at mobile, stand-alone and public health facilities was waiting times. A key finding was that consistently across studies, waiting times were shortest at mobile and longest at public health facilities (Chapters 2, 3, 4). Although shorter queues did not influence a user's choice of service provider (Chapter 2), long queues were a source of frustration in public health facilities. "*The clinic has long queues and you wait forever... at the tents there are no queues.*" (Female, 24 years) (Chapter 3).

The proportion of users reporting waiting times ≤ 15 minutes was highest for those who accessed mobile (86%) compared to stand-alone (57%) and public facilities (13%). The majority of users at mobile and stand-alone (100% and 86% respectively) reported a duration time of less than 30 minutes for the entire HIV testing process, whereas only 23% of participants at public health facilities reported a similar duration (Chapter 4). Overall, waiting times at the mobile and stand-alone were shorter compared to public health facilities, with the shortest times reported at mobile. Long waiting times at public health facilities are well documented in the literature (36)(37)(38)(39) and are somewhat expected, due to the wider range of services offered at these facilities compared to the mobile and stand-alone (which offered a limited range of services related HIV testing). Offering a wider range of services will attract a higher number of users. Health service providers should be cognizant of the patient to healthcare worker ratio to avoid unnecessary long waiting times. In addition to addressing staff shortages (40), public health services could consider improved patient flow inside facilities to reduce waiting times (40). The recent availability of self-testing kits could also be considered (41) as issuing these kits will greatly diminish time spent waiting inside health facilities for an HIV test.

Long waiting times may pose a barrier to potential users (42)(43) who may not feel ill or be symptomatic, but merely want to find out their HIV status. More research is needed around how long waiting times impact on access to preventative care compared to access for treatment services or when an individual feels ill. Some first-time testers reported long queues in public health facilities as a reason for never having tested previously (Chapter 5).

While some users may have reported long queues or longer services, they may not necessarily have perceived this as unacceptable and reported being satisfied with the service received. Users may accept that if you access a public health facility, you have to wait in a long queue and perceive this as part of the nature of the service. This reinforces the idea that acceptability is related to perceptions and expectations; if you utilize a public health facility, you wait in a long queue.

8.4.3 Health provider demeanor

The demeanor of healthcare providers varied from a user perspective. First-time testers perceived health workers as disrespectful and not fully trained, and reported these as reasons for never having tested previously (Chapter 5). Sentiments from other participants are summed up by: *“Clinic staff are friendly, but there are a few nurses that are rude”* (Female, 30

years)(Chapter 3). No negative staff attitudes were reported by users who accessed the mobile (Chapters 3 and 4), “*Staff are nice and friendly... I was welcomed with a big smile*” (Female, 19 years). The varied responses in this dissertation are similar to what is contained in the literature; some studies that show user satisfaction with clinic staff (44) (36), while others found that clinic staff did not treat users with sufficient respect (34)(39).

While users of the mobile and stand-alone services reported favorably regarding staff attitudes compared to users of public health facilities (mixed reports), it is important to bear in mind that users are reporting their perception of staff attitude based on their previous experiences together with their expectations. While it is difficult to make conclusive statements regarding staff attitudes across modalities, it is important for service providers to be aware that staff attitude plays a role in how the user experiences HIV testing, which will, in turn, affect whether they return to health services in the future. Anticipated disrespect from health providers has been shown to be partly accountable for delayed health seeking (19). This may also affect linkage to care. If potential users perceive staff at HIV services to be unfriendly, they may not engage in HIV care. It is important that healthcare providers are viewed as friendly, competent and trustworthy. This will go some way to reaching and diagnosing those unaware of their HIV-positive status, linking them to HIV care and assisting them to remain in care.

8.4.4 Stigma

Individuals perceived stigma differently at mobile and public health facilities. A user reported that everyone knows you at the health facility, “*the minute you enter the room they know what you are there for and decide that you are HIV positive ... there is no discrimination [at the tents]...*” (Female, 22 years). Another user reported the opposite, “*At the clinic at least I am ok because there is a lot happening there, but at this one [tents] they know straight away there is nothing else but [HIV] testing here*” (Female, 21 years)(Chapter 3). These opposite sentiments highlight the association between personal experiences and perceived stigma.

Stigma is well documented in the literature as a barrier to accessing health services (45) (46) and specifically HTS (26)(47)(31). The reporting of fear as a major barrier to testing may indicate the presence of stigma (45)(48) and the perceived disgrace of being associated with something that is socially unacceptable (49). Fear was reported by 40% of first-time testers as the reason for not testing previously. They describe fear of being seen at an HTS, fear of testing HIV positive and general fear (Chapter 5). These ‘fears’ may well be driven by underlying

stigma. Further research is needed to better understand the underlying reasons why individuals report fear as a barrier to HIV testing.

First-time testers also reported reasons why they now tested for HIV, with 41% reporting a need to know their HIV status (Chapter 5). The ‘know your status’ campaigns in South Africa, together with the drive to offer HIV testing more widely, may play a role in making HIV testing more ‘normalized’ and reducing stigma around testing. This may be one reason why first-time testers accessed the mobile and stand-alone services. Higher levels of HIV testing are associated with increased knowledge around HIV and reduced HIV-related stigma (50). In addition, ‘normalization’ of HIV testing may be evident at mobile services. Due to the nature of the service, potential users sat and waited in open public spaces, outside tents and a mobile van that clearly stated that HIV testing was on offer. This was at busy train stations and taxi ranks, and along busy streets, with many community members walking past. Although not scientifically evaluated, this observation does prompt a hypothesis: placing HTS in public places will assist in ‘normalizing’ HIV testing and potentially reduce stigma. Future work should test this hypothesis.

Stigma clearly does still exist and further interventions are needed to reduce HIV-related stigma, ‘normalize’ HIV testing and thereby increase the number of individuals who test, specifically those who have never been tested. Community-based HIV adherence clubs have been noted as an intervention that can reduce HIV-associated stigma and discrimination (51). They are currently used to improve retention in care for stable ART patients (52) and to decongest health facilities (51). An opportunity exists to have integrated chronic illness clubs, which dispense treatment to all individuals with chronic diseases, including those living with HIV. To reduce HIV-associated stigma and encourage earlier testing, it may be beneficial to provide strong messaging that positions HIV as a chronic illness. Some integrated clubs do exist in the Western Cape, but, to date, there is no published literature on the association between community-based integrated chronic illness clubs and a reduction in HIV-related stigma. There remains much work to be done around ways to ‘normalize’ HIV testing in order to increase testing uptake. Community-based interventions clearly have a role to play in achieving this.

8.4.5 Privacy

Lack of privacy was reported at both the mobile and public health facilities for different reasons. Some users reported that the tents used for the mobile service were a private space,

while others reported that they felt they were stigmatizing because of their public placement. Those who accessed public health facilities perceived stigma associated with overcrowding and lack of private spaces within the facility (Chapter 3). These findings again reflect users' experiences and sensitivities. Health service providers need to be reflect on ways to minimize the perceived lack of privacy. Issues of privacy were raised by individuals who had accessed an HIV test. There was no indication from first-time testers that a perceived lack of privacy had been a barrier to HIV testing previously, although lack of privacy has been documented in the literature as a barrier to testing (43)(53).

8.5 HEALTH-SEEKING BEHAVIOR

Access is only truly realized when an individual is empowered to use the health system (15). The notion of empowerment is that individuals have the choice to select and access an HTS that suits their lifestyle (54). Health-seeking behavior provides an understanding of how populations engage with health systems (55), in terms of their socio-cultural, economic and demographic circumstances (56) and is therefore an important part of the discussion around access to HTS.

8.5.1 User needs

User needs will differ from one individual or population to another and no one service can meet all needs. This dissertation shows that males and older individuals sought an HIV test at mobile, females and older individuals tested at stand-alone, and females and younger individuals tested at public health facilities. Each of these populations has individual needs and chose a testing service based on these needs.

There are indications that individuals may choose to walk further to access an HIV test and 'bypass' (57) their closest HTS. Users may perceive a negative experience if they test at the closest HTS, for example; they may fear someone they know will see them, the healthcare provider will judge them or perhaps their closest HTS has very long queues. These users are then prepared to walk further to access an HTS, which they perceive to be better suited to their needs. This point relates to the cost of stigma and how it affects access. While this dissertation clearly shows that users will access stand-alone and public health facilities (fixed sites) that are within walking distance and mobile services as they pass by, it is unable to determine if users had accessed the HTS closest to them. This creates an opportunity for future research.

This dissertation has shown that user needs can include issues over and above health system factors. An individual's awareness of signs or symptoms of disease may be related to access. Awareness of symptoms has been associated with voluntary uptake of counseling and testing (58). A higher proportion of users were diagnosed with HIV at stand-alone compared to mobile (Chapter 7). Users who accessed the stand-alone may have identified signs or symptoms of disease within themselves and actively sought an HIV test. Users at mobile may have used the immediate opportunity to test that the mobile service offered and may not have been aware of any signs or symptoms of disease. A user's awareness of signs or symptoms of disease may be associated with the HTS at which they test.

As indicated in Chapter 5, first-time testers did not test previously because they perceived themselves to be at low risk for HIV or were unaware of the importance of knowing their status. These findings concur with the literature (20)(48). In addition, not everyone bases their testing decision on their perception of the availability, affordability or acceptability of the HTS. Some individuals are driven by an emotional decision to test. They may have family or friends who are living with or have died from HIV (59) or they perceive themselves to be at risk for HIV (have an unfaithful partner, practice unsafe sex) (59). The framework used in this dissertation views health-seeking behavior as the manner in which the user engages with the health system. The psychosocial factors that prevent or drive an individual to test indicate that there do exist factors, which play a role in access to HIV testing, but are not linked to the availability, affordability or acceptability of the health service.

8.5.2 Health service provider 'responsiveness' to user needs

Health service providers must understand the needs of the potential user and be 'responsive' to those needs. Health service providers are well placed to address user needs in terms of availability, affordability and acceptability. Service providers are able, to a greater or lesser extent, to determine where and when to provide HTS, the range of services offered, patient flow, levels of privacy, their attitude toward users, etc.

It is vital to have alternative service offerings available in the same communities so that potential users have a choice to use the service that is a 'best fit' for them. For example, this dissertation indicates that men need a service that is immediately accessible and in close proximity to where they are, with short waiting times. The mobile met this need and men accessed mobile services in our setting. This example highlights how a mobile service is able to respond to the needs of men and contribute to increasing access to testing for men. In

contrast, public health facilities may remain the provider of choice for women who live within walking distance and have to attend regularly for sexual and reproductive health services. When they go for these visits, they use the opportunity to request an HIV test at the same time. Public health facilities therefore can meet the needs of females who want an HIV test.

Structuring HTS services to be in the right places at the right times will go some way to making HTS available and affordable and empowering potential users to access HTS. Structuring HTS to be responsive to the needs of users, who do not typically utilize a public facility, requires a flexible service provider. Service provision by NGOs is important to consider in this situation. Local NGOs implemented the mobile and stand-alone services that formed part of the CB-HCT initiative. These local NGOs have the ability to be responsive to the needs of users because of the manner in which they are organized (fewer levels of staffing and less bureaucracy) (60). This flatter structure allows them to adapt their service to the changing needs of users. By nature, the infrastructure of an NGO-led mobile service is flexible. For example, mobile services, utilizing tents and a mobile van, can be easily set up at different locations on different days to reach specific targeted populations. Many decisions that impact on availability, affordability and acceptability of HTS can be quickly decided within NGOs due to the consultation process being fast because of relatively flat management structures (60). Examples of decisions include the provision of HTS outside of standard business hours, inclusion of additional services, change in user flow, change in HTS process, etc.

NGOs are well placed to provide HTS (61), but their work is often constrained by funding. This is one of the big limitations faced by NGOs as service providers. NGOs are often highly dependent on international donors (61), as was the case for the CB-HCT initiative. Being reliant on grants does limit capacity to develop, implement and sustain programs. Governments must recognise the ability of NGOs to offer testing services to users who would not typically access public health facilities and assist the facilitation of NGO-led programmes that are capable of increasing access to healthcare and HTS specifically. Sustainability of NGO-led HTS requires further consideration, especially if costs to provide these services are high.

8.6 CONSIDERATIONS FOR SCALE UP OF THE CB-HCT INITIATIVE

This dissertation is around access to HTS from a user perspective, specifically to understand access to the CB-HCT initiative implemented in Cape Town. The sections above indicate the availability, affordability and acceptability of the mobile and stand-alone services. However, it would be incomplete to discuss access without discussing the cost of implementing the

initiative, using NGOs as the service provider. This section broadens the discussion, providing a service provider perspective, which is essential when considering scale up and sustainability of HTS.

One mobile and stand-alone service, offered in the same community was purposively chosen for inclusion in the costing study (Chapter 7). The chosen services were representative of all mobile and stand-alone services within the CB-HCT initiative. The overall annual cost of these two services in 2014 was \$ 174 380. Mobile cost less than stand-alone (\$77 764 and \$96 616 respectively). Of the three cost categories (personnel, recurring goods/services and capital goods), personnel costs accounted for 50% of the total costs. These findings concur with studies that found personnel costs to be a cost driver (62)(63). High personnel costs highlight the importance of the need to manage personnel well to ensure efficiency. Good management and efficient personnel typically requires recurrent training and monitoring and evaluation of the service, which all comes at a cost. The CB-HCT-initiative had a number of management levels and provided continual trainings with regular refresher trainings for all staff to ensure competence. These costs may have ensured a quality HTS on the ground, but may have made the initiative too expensive to scale up. To reduce cost and improve sustainability, one consideration is to reduce the number of management personnel to reduce overall personnel costs without reducing training or monitoring and evaluation. Another consideration is to employ trained HIV lay counselors to do all HIV testing instead of nurses. This would keep the overall personnel cost the same, but would provide more personnel available to do HIV testing and would presumably result in increased numbers of individuals being tested. Future studies could determine if this would be more cost-effective.

In addition to the cost categories, the CB-HCT initiative was divided into seven pre-determined components and each component was costed. Components included administration, capacity building (training/coaching/mentoring), monitoring and evaluation, data management, planning, direct service provision, and overheads. Overall, service provision and overheads accounted for the majority of the expenditure (36% and 37% respectively). As service provision was the core function of the initiative, we expected that it would account for a high proportion of the overall costs. The high proportion of overhead costs was interesting. Overheads were directly as a result of the way in which the initiative was implemented and predominantly associated with ensuring quality; good management (general and data); high levels of monitoring and evaluation; and, continual coaching and training. This again

highlights the interconnectedness between quality of a service (effective and efficient) and costs.

There is a paucity of literature on overhead costs related to NGO-led HTS, making the findings in Chapter 7 important. They provide a fundamental understanding of the relationship between the manner in which an HTS is implemented and the associated costs. I would argue that having such high overheads would prohibit scale up of the initiative as is. This would also affect sustainability. Perhaps future costing studies should consider the cost of program implementation separately from the costs for improving program efficacy (64) – for which good management and monitoring and evaluation are imperative.

Capital costs (assets, equipment) were higher at mobile than the stand-alone because of the mobile van and tents used. The uniqueness of mobile, compared to stand-alone and public health facilities in terms of the populations that access mobile, for example men, make it an important service to consider for scale up, even though capital costs can be high.

The mean cost per person tested for HIV at mobile was lower than at the stand-alone service (\$25 and \$51 respectively). This concurs with other published studies (65) (66). While the cost per person tested at mobile (\$ 25) was similar to other published studies (29) (67), the cost per person tested at stand-alone was higher than what has been published (66) (68). The fact that mobile reached large numbers of users compared to the stand-alone makes it a viable option when there is a need to reach many people and therefore also a viable service to consider for scale-up.

However, the mean cost of diagnosing a person with HIV (\$1 051) and of successfully linking an HIV-infected person to HIV care (\$2 102) at mobile was higher than at the stand-alone service. This was because HIV yield and proportion linked to HIV care was lower at mobile (Chapter 6 and 7). If mobile is to be scaled up, future research is required to investigate factors associated with linkage to care from mobile services to provide an empirical basis for designing interventions aimed at improving linkage to care specifically from mobile services.

The above highlights important considerations for health service providers regarding scale-up of mobile and stand-alone testing services. A realistic understanding of the cost to implement NGO-led mobile and NGO-led stand-alone services (Chapter 7) is vital. The findings allow for insight into the actual costs expended for NGO-led HTS and provide some fundamental information that health service providers can use when considering scale-up. Although, we did

not have the data to be able to include a costing of HIV testing at public health facilities, Chapter 7 adds to the very limited published data that exist on the actual cost to provide NGO-led mobile and stand-alone HTS.

The CB-HCT initiative was designed as a collaboration between the university and various NGOs. The main role of the NGOs were to implement the initiative. The university provided training, monitoring and evaluation and analysed data. This partnership was designed for sustainability. The input of the university was necessary to demonstrate proof of concept and for transference of skills and knowledge to the NGOs. Although costly, this was necessary. NGOs can continue independently to provide the same level of service without input from the university, thereby sustaining the initiative in a more cost efficient manner i.e. without huge overhead costs.

8.7 STRENGTHS AND LIMITATIONS

8.7.1 Strengths

The entire dissertation is directly applicable within the broader HIV environment: aimed at working toward bringing the HIV epidemic under control. The dissertation is directly aligned to the UNAIDS '90-90-90' target and is firmly positioned within the first '90' with links to the second '90'. The entire target hinges on attaining the first '90': finding and diagnosing those who are unaware of their HIV-positive status. Understanding how to increase access to HIV testing from the user's perspective is therefore vital.

This dissertation uses a conceptual framework that permits access to be measured along three mutually exclusive dimensions. To date, the framework has only been applied to public health services within South Africa. It has never been applied within the context of NGO-led health services or for HTS specifically. This makes its application within this dissertation unique.

A major strength of this work is that it combines studies that have utilized a variety of datasets; a routine dataset with a large number of clients as well as research datasets, with varying sample sizes. The studies included contain both retrospective and prospective data. The main findings from these various datasets concur, strengthening these findings.

A second major strength is that both quantitative (including cost data) and qualitative data were collected. This provides results from different perspectives. The qualitative data give rich and stimulating meaning to the quantitative results. Similar findings from the quantitative and

qualitative data collected make a strong case for the results. The cost analysis provided another perspective and an understanding of the scalability of the NGO-led CB-HCT initiative. As actual costs were included, the findings provide a realistic assessment of definitive costs compared to many published studies that utilize retrospective cost data collection, which may be subject to recall bias or poor record keeping.

Data were collected at different points during the HIV testing process: after users had an HIV test, but before they received their result (Chapter 5); after users had completed the HIV testing process, but before they exited the service (Chapters 2 and 4); and, up to one month after the user's HIV testing experience (Chapter 3). Chapters 6 and 7 used routinely collected retrospective data.

Data collection also occurred at different times within South Africa's response to the HIV epidemic between 2008 and 2015. During this period, HTS was expanded, the national HIV testing campaign took place and the ART guidelines continually changed, increasing the number of individuals eligible for ART. Against this changing HIV landscape in South Africa, users consistently reported similar issues regarding availability, affordability and acceptability of HIV testing strengthening the findings overall.

Finally, the operational nature of the studies contained within this dissertation allow for practical recommendations regarding health system strengthening initiatives related to increasing access to HTS in similar settings. While studies were scientific in their aim, design, methodology and analysis, they were conducted outside of a controlled research environment. They were embedded within a CB-HCT initiative, which provided mobile and stand-alone HIV testing services. The findings therefore provide a practical understanding of how the CB-HCT initiative is able to accommodate user needs and overcome some barriers to testing, thus providing an understanding of health-seeking behavior of users who access alternative HIV testing modalities compared to those who access public health facilities.

8.7.2 Limitations

This dissertation has a number of limitations. This dissertation only includes those who self-initiated an HIV test. It excludes those who receive provider-initiated testing and those who have never tested for HIV at all.

Access is likely to be different for individuals who self-initiate an HIV test compared to those who receive provider-initiated testing. These populations may have different health-seeking

behavior and differing needs with regard to availability, affordability and acceptability. Although the findings are limited to populations who self-initiate an HIV test, they provide important information about their needs in terms of availability, affordability and acceptability. As we work towards expanding access to HIV testing outside of health facilities, we need a more thorough understanding of health-seeking behavior for populations who self-initiate an HIV test.

This dissertation only includes studies with cohorts who had accessed an HTS because the dissertation addresses access from a users' perspective. I acknowledge that it is limiting to exclude the perspective of those who have never tested for HIV, when wanting to understand access. To address this limitation, I provide results from a currently unpublished qualitative study that included 14 individuals who reported to have never tested for HIV before and who live in the same communities in which the CB-HCT initiative was implemented. Their self-reported barriers to testing were similar to issues highlighted in this dissertation. These included long waiting times (*"sitting there for a long time while only being there for something small"* - male, age unknown) and fear (*"...go for a test and find out I have this disease... I will forever feel tortured"* - male, 32 years), as well as stigma (*"I'm afraid that if it will be known about in the community it won't sit well with me"* - male, 19 years). It is interesting to note that the majority of these individuals had all been inside health facilities for various reasons including STI treatment, but had never had an HIV test. This may indicate that stigma and fear are associated with HIV services specifically and not necessarily with health services in general. In addition, the never tested also reported challenging life circumstances, whereby they face daily struggles and are trying to cope with traumatic childhood experiences (*"...cannot think clearly...something goes on in my brain..."* - male, 20 years). Others reported an apathy to testing (*"I am lazy to go there"* - male, 32 years) and low HIV risk perception (*"I do not test because I know that she has nothing"* - male, 32 years). These reasons for not testing may be associated with a feeling of disempowerment. Future work on access should include those who have never tested in order to gain a different perspective.

Not every study compared data from users at all three services. Some studies compared data from users who accessed either mobile or public health facilities (Chapters 2 and 3). Mobile services are the least like public health facilities making it important to compare these two modalities (the stand-alone is similar to public health facilities in terms of being a fixed structure). The mobile reached far higher numbers of users than the stand-alone, making it an

important comparison to public health facilities. Other studies included data from users who accessed stand-alone or mobile (CB-HCT initiative) (Chapters 5, 6 and 7). These studies are important to understand the CB-HCT initiative better. This understanding is pertinent, in order to evaluate the contribution that the CB-HCT initiative makes toward increasing access to HIV testing. One study (Chapter 4) includes data from users across all three modalities. Although I did not have data from all three modalities for every study included, this limitation is potentially overcome as the main findings concur with each other and with the published literature.

There is insufficient focus on indirect user costs within the dimension of affordability. While direct user costs were explored in multiple studies, indirect user costs were only explored in one study (Chapter 4). Both direct and indirect costs are important to measure. Future studies should place more emphasis on the association between indirect user costs and affordability in relation to access to HTS. Further, affordability was not measured in terms of the cost to access HTS as a proportion of the household income. However, due to the similar socio-economic status of users across all modalities, ability to pay was assumed to be similar.

The entire dissertation pertains to the general population living in peri-urban communities within one South African district. The communities included were those in which the CB-HTS initiative was implemented. Although the main findings concur with other published studies conducted in similar districts, the health-seeking behavior of users may differ across regions and across settings (rural versus urban). Different settings may pose different challenges regarding service providers being able to respond to the user's needs. The findings from this work therefore have limited generalizability due to the geographical area and localized setting.

Linkage to care findings (Chapters 6 and 7) were reliant on self-reported data. This is indicative of the operational nature of the study. It was not logistically possible to check linkage to care against health facility records. Linkage to care may have been under-reported, as some users may have taken time to come to terms with their HIV status and only linked to care after three months. This under reporting may be balanced by potential over-reporting by those who preferred to give a socially desirable response.

Sample size differed between the quantitative studies. Some studies had small sample sizes: Chapter 4 (n= 130) and Chapter 5 (n=229). Other studies had large sample sizes: Chapter 2 (n=1063), Chapter 6 (n=79 545) and Chapter 7 (n=5031). The limitation around

generalizability of the findings from the studies that had small sample sizes is potentially overcome by those with larger sample sizes, as the main findings were similar in all studies.

8.8 EVIDENCE-BASED LESSONS LEARNT FOR PROGRAM IMPLEMENTATION

The findings from this dissertation highlight the following lessons that can be practically applied when implementing HTS within a peri-urban setting.

The key findings include:

Men, first-time testers and older individuals can be reached through mobile testing services. Younger individuals access stand-alone services and public health facilities.

Opportunity to test plays a key role in the uptake of HTS. Opportunities are created in different contexts and service providers can create these opportunities. The portable nature of a mobile service allows HIV testing to be delivered close to where the targeted population is likely to be, for example at transport hubs to reach males. Offering a range of services, as is done in public health facilities also creates opportunity to test. When a user accesses a service for another reason, for example family planning, they may decide to test for HIV as well.

Proximity of the HTS to the user is directly related to affordability for the user. Providing services in close proximity to users ensures that transport costs are nil or at least minimal and reduce the cost burden.

Health service providers need to address long waiting times. Waiting times at mobile and stand-alone services were short, making these services viable options to consider for reaching populations who do not want to wait in long queues.

Service type was associated with linkage to care. Those diagnosed at mobile were less likely to link to HIV care than those diagnosed at stand-alone. We also found that mobile diagnosed and linked larger numbers of individuals to care. This gap highlights the need to strengthen linkage to care interventions, specifically from mobile services.

Improved linkage to care from mobile services will improve the cost efficiency of mobile services. As we increase the number of HIV-infected individuals at mobile services who link to care, the mean cost of diagnosing and linking a person to care will decrease, making mobile services more cost efficient.

Other compelling evidence includes:

Addressing the tangible aspects of HIV testing, i.e. the logistics, may be a good way to start working toward a more acceptable service. Putting strategies in place to ensure privacy may start to address issues of lack of confidentiality and stigma. For example checking the placement of mobile tents so that conversations cannot be overheard or ensuring lockable counseling rooms so that no one can enter during counseling and testing.

NGOs are well placed to offer HTS, integrated with related health services including linkage to care. Health systems should appreciate the strengths of NGOs and consider integrating NGOs into the health system as service providers.

There is a need to strengthen linkage to care interventions from mobile services specifically, due to the large proportion of individuals not linked to care at mobile. Higher linkage to care at mobile is likely to have a significant impact on increasing linkage to care overall and moving us closer to reaching the '90-90-90' target.

While these findings cannot necessarily change policy, because all studies were carried out within one district in one Province of South Africa, they can influence management & provide practical recommendations for health services going forward. Some of the lessons learned could be put into the South African Country Operational Plan (COP). They have the potential to influence the provincial strategic plan for HIV/AIDS, STIs and TB. The lessons learned will be shared with Government and international donors e.g. PEPFAR. The practical recommendations do make this dissertation highly relevant within the current South African HIV context.

8.9 WHAT DOES THIS DISSERTATION CONTRIBUTE OVERALL TO THE SCIENTIFIC KNOWLEDGE BASE?

The CB-HCT initiative provides a unique case study: various NGOs in partnership with an academic institution, provided an integrated HTS in communities around Cape Town. The HTS was provided from two alternative modalities; stand-alone and mobile. While NGOs were responsible for service implementation, the academic institution was responsible for the overall management, ensuring contractual obligations to the funder, providing technical assistance to the NGOs (training, mentoring and funding), data management and overall financial management. This partnership enabled capacity building within both organizations (NGO and

academic institution) through reciprocal transference of skills and knowledge via training, mentoring and coaching.

This dissertation uses a framework, previously only used to measure access to health services in general. This is the first time that it has been applied to HTS and specifically to NGO-led community-based mobile and stand-alone services. The easy application of the dimensions of access to HTS provides a strong case that the framework can be applied across public and private health settings when determining access, along these three dimensions.

The research studies included in this dissertation are based on the operations of the CB-HCT initiative. They take place in a ‘real world’ setting. The findings are therefore relevant in the current South African HIV climate. Most published studies that include HTS at public health facilities include provider-initiated HTS. These findings pertain to those who self-referred for an HIV test and demonstrate the health-seeking behavior of users at mobile, stand-alone and at public health facilities.

The studies indicate how inter-related availability, affordability and acceptability are in a ‘real-world’ setting. While the framework describes each dimension as mutually exclusive and independently measurable, in practice they are associated and linked. HTS that are in close proximity to users will reduce costs associated with transport for those users, linking availability and affordability. Providing HTS in a specific setting for a specific population, e.g. workplace or school, will typically have short waiting times (due to a contained number of individuals in that setting), thereby linking availability and acceptability.

Considering the user perspective when seeking to increase access to HIV testing is another vitally important issue emanating from these findings. Acknowledging that potential users have differing needs (pertaining to availability, affordability and acceptability) and tailoring services in line with these needs is critical to ensure that potential users, currently unaware of their HIV status, are more likely to access services. Increased user responsiveness by service providers is paramount.

The findings further highlight the differing health-seeking behavior linked to each of the HIV testing modalities. Users at mobile were spontaneous in their decision to test and used the immediate opportunity that the mobile provided. Users at stand-alone actively sought out this service, potentially aware of signs or symptoms of disease. Users at public health facilities used

the opportunity to test when they visited the facility for another related service or because they were familiar with the facility.

When considering availability, geographic accessibility is important for HIV testing uptake. Users accessed an HTS within walking distance from where they lived or worked. While the importance of the proximity of a testing service to a potential user for increased test uptake may not be new for health services research generally, it is important data for stand-alone centers, for which there is a paucity of data in the literature. Although stand-alone centers may be similar to public health facilities, in terms of their fixed premises and location, it is important to know how users perceive availability of stand-alone centers. Users who live and work within walking distance to a stand-alone center, will access the stand-alone for an HIV test.

This dissertation is able to share evidence-based lessons learned from the CB-HCT initiative to inform program implementers about considerations for providing community-based HTS to meet the health-seeking behavior of potential users.

8.10 CONCLUSION

This dissertation addresses access to HIV testing. Specifically, it addresses the availability, affordability and acceptability of a CB-HCT initiative (mobile and stand-alone services) implemented in Cape Town, South Africa. The needs of users differ and not everyone feels equally empowered to access an HIV test. This dissertation shows that the CB-HCT initiative (mobile and stand-alone services) can contribute to increasing access to HIV testing for males and older individuals. It provides an accessible service that allows individuals to test in close proximity to where they are. The mobile offers an immediate opportunity to test for those not thinking about having an HIV test at the time and potentially unaware of signs or symptoms of disease. The CB-HCT initiative did not have high user costs and offered short waiting times and friendly, competent and trustworthy healthcare providers. While this dissertation is unable to quantify the increase in access to HIV testing due to the initiative, it is able to provide many practical recommendations to service providers who aim to make their service more available, affordable and acceptable.

Ultimately, the South African government (Department of Health) is responsible for supplying HIV services for its citizens. Public health services will always offer HIV testing, providing services to those who self-initiate for an HIV test at their facilities or reaching those who enter a health facility for another service through their provider-initiated approach. Due to the nature

of these facilities, the range of services provided (not only HIV testing) and the infrastructure (fixed sites) together with the huge number of individuals who rely on public services, makes it difficult to consider offering HIV testing in any other way. Public health services remain the important standard of care.

However, to reach the UNAIDS '90-90-90' target, South Africa has to go beyond the 'standard of care'. HIV testing is the critical entry point to HIV care and treatment. Increasing access to HIV testing requires a shared responsibility between government and private service providers, including NGOs. NGOs can offer alternative HTS (including community-based mobile and stand-alone services) that can make services available, affordable and acceptable to different populations. It is not a case of one service provider offering a better or worse service than another. Each testing service offers a unique infrastructure and management of the HIV testing process. Civil society (including NGOs) in partnership with government have been important thus far in responding to the HIV epidemic and working to bring it under control. I argue that there should be recognized arrangements between public health services and NGOs, who both make resources available and act to achieve more together than they would individually (69).

When formulating guidelines aimed at increasing access to HIV testing, it is essential to understand the user's perspective (38) and to start to build a more user responsive health system. The needs of users and the services offered are not mutually exclusive (70) and must be viewed together in working toward increasing access to HIV testing. Service providers who understand the needs of targeted populations can tailor their services to meet those needs; making their services more available (71) acceptable and affordable to those populations. Findings from operational research can provide practical recommendations for program implementation. This dissertation provides important insight into the availability, affordability and acceptability of NGO-led mobile and stand-alone HTS in a peri-urban setting in South Africa. The findings are highly relevant within the current South African HIV context and the practical application of the findings make this a meaningful dissertation.

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ADDENDUM: ADDITIONAL WORK RELATED TO THIS DISSERTATION

The CB-HCT initiative project culminated in a publication: A Practical Guide to Implementing Community-based HIV-Prevention Services. Experiences shared and lessons learned from South Africa.

In 2016, the United States Centers for Disease Control and Prevention - CDC South Africa approached the DTTC and requested that we consolidate our learnings and best practices into a guidance document to share with others involved in implementing community-based HIV-prevention programs. The guide was as a result of large parts of this dissertation and some other work in DTTC and was launched in June 2017.

Scientific evidence tells us which interventions we should implement if we want to reduce HIV transmission, but limited information exists on how to implement these interventions in a community-based setting. The guide encompasses pertinent aspects for the implementation and management of community-based HIV-prevention services. Although predominantly based on experiences of HIV counseling and testing programs, many of the key principles can be applied across other types of community-based HIV-prevention programs that happen outside of health facilities.

This guide is targeted to anyone planning to implement community-based HIV-prevention services.

It can be downloaded from the following website:

<http://www.sun.ac.za/english/faculty/healthsciences/paediatrics-and-child-health/Pages/A%20Practical%20Guide.aspx>

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